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THE UNITED STATES OF AMERICA

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1916.

No. 3, Original.

THE PEOPLE OF THE STATE OF NEW YORK, COMPLAIN-
ANTS,

vs.

STATE OF NEW JERSEY AND PASSAIC VALLEY SEWER-
AGE COMMISSIONERS, DEFENDANTS.

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VOLUME IV.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,

vs.

STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

EXHIBITS

COMPLAINANTS' EXHIBIT No. 1. James D. Maher, Commissioner.

Stenographer's Report of a Public Hearing Given by the New York Harbor Line Board, in the Army Building, New York City, December 9, 1908, in the Matter of the Application of the Passaic Valley Sewerage Commission for the Consent of the War Department for the Construction and Maintenance of a Trunk-outlet Sewer Beneath the Waters of Newark and New York Bays.

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- 1 Stenographer's report of a public hearing given by the New York Harbor Line Board in the Army Building, New York City, December 9, 1908, in the matter of the Application of the Passaic Valley Sewerage Commission for the consent of the War Department to the construction and maintenance of a trunk outlet sewer beneath the waters of Newark and New York bays.

Present:

The New York Harbor Line Board, as follows:

Colonel D. W. Lockwood, Corps of Engineers,

Colonel E. H. Ruffner, " " "

Colonel John G. D. Knight, " " "

Lieut. Col. S. W. Roessler, " " "

The following gentlemen were also present:

Julius A. Lebruecher, Chairman of and representing the Passaic Valley Sewerage Commission.

Francis Child, Counsel for the Passaic Valley Sewerage Commission.

Eldow W. Harrison, Chief Engineer for the Passaic Valley Sewerage Commission.

Maurice B. Dean, Counsel representing the Attorney General of the State of New York.

Rudolph Hering, Civil and Sanitary Engineer, New York City.

Michael Dunn, Attorney, Paterson, N. J.

Poultney Bigelow, Journalist, New York City.

Theodore Backers, representing the Attorney General of the State of New Jersey.

John H. Eastwood, Belleville, N. J.

Morris R. Sherrard, City Engineer, Newark, N. J.

- 2 Dr. Geo. A. Soper, President Metropolitan Sewerage Comm'n.

Gustave Schwab, New York City.

A. F. McBride, Mayor of Paterson, N. J.

J. C. Payne, Secretary and Engineer, Riparian Commission of New Jersey.

Mr. Heck, Board of Trade, Jersey City, N. J.

Chanler W. Riker, Counsel for the Passaic Valley Sewerage Commission.

A. Foster Higgins, representing the Chamber of Commerce, of New York City.

B. L. Stowe, representing Jersey City Board of Trade.

Anderson Price, Attorney at Law, New York City,—residing at Paterson, N. J.

Welding Ring, President, New York Produce Exchange.

Dr. Thomas Darlington, Commissioner of Health, New York City.

Hugh Gordon Miller, representing the Attorney General of the United States, in the case.

Joseph Coult, Newark, N. J.

Dr. Eugene H. Porter, State Commissioner of Health, New York.

Alfred E. Ommen, representing the West End Association, New York City.

Alfred R. Conkling, President, Realty League, New York City.

John Monk, New York City.

J. T. Colyer, New York City.

Captain Parsons, Maritime Association, New York City.

Prof. Olin H. Landreth, Sanitary Expert.

Dr. Daniel D. Jackson, Sanitary Expert.

William S. Ackerman, Member, Passaic Valley Sewerage Commission.

Coleman E. Kissam, Mayor, representing the City of Orange, New Jersey.

Dr. George W. Brush, President of the Brooklyn League, Brooklyn, New York.

3 Arthur Sandford, Contractor, Newark, N. J.

Dr. C. T. Schondelmeier, representing the Broadway and Allied Press Trade, Brooklyn, N. Y.

The Chairman: Gentlemen, if you will come to order, I will state the objects of this hearing.

The hearing is called, subject to the following notice:

"United States Harbor Line Board for Harbor of New York and Adjacent Waters.

ARMY BUILDING,

NEW YORK CITY, November 14, 1908.

1. Under the Laws of the State of New Jersey, the Passaic Valley Sewerage Commission propose to intercept the sewage from the district now discharging into the Passaic River below the Great Falls at Paterson and the tributary district which may hereafter discharge into said river, and convey it beneath the waters of New York and Newark Bays by means of a trunk outlet sewer ending near Robbins Reef in Upper New York Bay.

2. Application has been made to the Secretary of War by the Passaic Valley Sewerage Commission for the consent of the War Department to the construction and maintenance of such sewer, and the matter has been referred to the U. S. Harbor Line Board for the Harbor of New York and its adjacent waters for a comprehensive report on this entire subject.

3. The Board will give a Public Hearing on this subject in the Army Building, No. 39 Whitehall Street, New York City, at 10 a. m. on Wednesday, December 9, 1908, which you are invited to attend.

4 Very respectfully,

D. W. LOCKWOOD,

Colonel, Corps of Engineers, Senior Member of Board."

The Chairman: The original papers in this case are as follows:

"WASHINGTON, D. C., Oct. 6, 1908.

Hon. Luke E. Wright, Sec'y of War.

DEAR SIR: I herewith hand you on behalf of my client, the Passaic Valley Sewerage Commissioners, application for consent of your department to the construction and maintenance of an outlet sewer beneath the waters of New York and Newark Bay, as fully described and shown by plans on said application.

As required by the regulations, I have also furnished two extra copies of the plan annexed to the application and also a copy of the opinions of Gener'l Henry M. Robert and other consulting Engineers on the matter as expressed in an official report made by the Commissioners to the Governor of the State of New Jersey, June 1903.

I shall be pleased to furnish the Department with any other available data desired in the proper consideration of this application.

Respectfully yours,

EDLOW W. HARRISON,
*Engineer, Passaic Valley Sewerage
Commission, Jersey City, N. J.*

5 The Chairman: These papers were forwarded to the Harbor Line Board by the following endorsement: "War Department, Office of the Chief of Engineers, Washington, October 13, 1908.

1. Respectfully referred to Col. D. W. Lockwood, Corps of Engineers, for report by the New York Harbor Line Board.

2. It is the desire of the Chief of Engineers that in considering this subject the Board give consideration not only to the interests of navigation, but also to the interests for whose benefit this work is proposed. In other words, it is desired that the report of the Board cover the entire subject in comprehensive manner.

3. An expression of opinion is desired as to the practicability of requiring the builders of this sewage disposal system to remove by dredging any deposit in navigable waters caused by the projected works.

FREDERIC V. ABBOT,
Acting Chief of Engineers."

The Chairman: The application to the Secretary of War, upon which this hearing is based, is as follows:

To the Honorable Luke E. Wright, Secretary of War of the United States of America:

Respectfully represent the Passaic Valley Sewerage Commissioners acting under authority of Chapter 10 of the Laws of 1907 of the State of New Jersey entitled:

An act to provide for the purification of the waters of the Pas-

saic River within the Passaic Valley Sewerage District prohibiting the discharge of sewage or other polluting matter into said portion of said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley Sewerage District, from the territory of which sewage or other polluting matter is or may be discharged into said portion of said river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor.

Propose to intercept the sewage from the district now discharging into the Passaic River below the Great Falls at Paterson, and the tributary district which may hereafter discharge into said river, and by the course of said river and Newark Bay and Kill von Kull now reaches the Bay of New York; and convey said sewage by means of a trunk outlet sewer extending from Paterson to a point of discharge in the waters of New York Bay East of Robbins Reef at a depth of not less than 40 ft. below the mean high water in said Bay.

The proposed alignment and grade of said outlet sewer, from the Westerly side of Newark Bay to the outfall into New York Bay, are as shown on the map and profile attached, and may be further described as follows:

The sewer will be in tunnel from a point West of the Western shore-line of Newark Bay, passing under Newark Bay, the upland of Bergen Neck, and under New York Bay on a line passing as near as may be practicable to the Light House on Robbins Reef to a point where the tunnel intersects the rock contour of the bottom of New York Bay.

At no point in the line beneath the navigable waters of the United States and outside of the established line for solid filling, will any part of such permanent structure, when completed, be less than 35 ft. below mean high water except upon the reef of rock North of and not more than 500 ft. from Robbins Reef Lighthouse where it is proposed to place a permanent shaft and shaft-house, rising to a height not more than 20 ft. above mean high water.

The point designated for said permanent shaft on Robbins Reef will be preferably where the rock approaches nearest to the surface, and consequently beyond the limits of safe navigation.

The tunnel will have an inside diameter of 12 ft. At the Eastern end, where the rock contour is intersected, four or more pipes of cast iron or reinforced concrete of diameters varying from 6 to 2 ft. will be laid in trenches on the bottom of the Bay to such distances (within the limits of the State of New Jersey) in any direction as may be deemed necessary to procure a quick and free dispersion and mixture of the sewage with a large volume of Bay water.

The pipes will be provided with proper openings along their length so that the total volume of sewage discharge may be broken up in units of volume so small as to be quickly dispersed and diluted with a large volume of Bay water.

No discharge opening will be less than 40 ft. below mean high water.

The discharge of sewage through said sewer at present will be from a population of about 600,000 people or practically 10% of the total discharge of sewage into the Bay of New York from the surrounding communities, including the territory to be served by the proposed sewer. The ultimate capacity of the sewer is computed to be for a population of 1,650,000 estimated to be reached in 1940, and it is contemplated will not at that time exceed the present proportion of 10% of the total sewerage tributary to New York Bay. It is proposed to subject the sewage to a process of thorough screening to remove matter carried in suspension, and also to provide for the sedimentation and removal of sand and grit, at the pumping station in the Newark Meadows, before allowing the sewage to enter the outfall tunnel.

The undersigned Commissioners respectfully request that the following works may be authorized, approved and permitted so far as they come within the jurisdiction and supervision of the War Department:

First. The construction and permanent maintenance of tunnels under navigable waters of Newark Bay and New York Bay, as shown by the plans attached.

Second. The construction, laying and permanent maintenance of four or more outlet pipes of a diameter varying from 6 ft. to 2 ft. in trenches beneath the navigable waters of New York Bay within the territory of the State of New Jersey, and not less than 40 ft. below the mean high water, as shown by the plans attached.

Third. Construction and permanent maintenance of a shaft, and shaft-house upon the rock of Robbins Reef not exceeding 100 ft. square, and not exceeding 20 ft. in height above high water.

The site of said shaft to be determined so as not to interfere with navigation, and not to be inconsistent with the proper uses of Robbins Reef for lighthouse purposes.

Fourth. The temporary erection and use, during construction, of such cribs as may be required for construction shafts in the navigable waters of Newark Bay and New York Bay West of Robbins Reef and outside the established lines for solid filling. The said construction to be located, built and maintained to the satisfaction of the United States authorities having supervision of said waters, and to be removed on the completion of construction.

Fifth. Permission to erect and maintain such temporary platforms, floats or other structures within navigable waters as may be required for the purpose of sounding and boring to determine the character of the bottom. The said structures to be located, built and maintained to the satisfaction of the United States authorities having supervision of said waters.

All work, in or below navigable waters, both permanent and

temporary, to be subject to the approval and supervision of the United States authority having jurisdiction over the said waters.

(Signed)

J. A. LEBKUECHER,
FRANCIS CHILD,
W. S. A. KERMAN,

Passaic Valley Sewerage Commissioners.

Attest:

JOHN S. GIBSON, *Clerk.*

Dated, Newark, N. J., September 23, 1908."

10 The Chairman: The Board will listen to the parties in interest, in the following order: First, the applicants, the Passaic Valley Sewerage Commission; Second, others who favor the project; Third, the Metropolitan Sewerage Commission and the New York Board of Health; Fourth, the navigation interests, as to the effect of the work proposed, in possible deposits in the navigable waters in question; and, Fifth, the Attorney General of the State of New York, represented by Mr. Dean, attorney at law, on the subject of pollution,—representatives of organizations, and individual interests, with regard to the subject of pollution. It is desired that any one addressing the Board shall come forward and first state their names, and speak distinctly, so that the stenographer can hear them. It is also desired that, as far as possible, the various interests will be represented by but one speaker, if that can be done. The Board will now hear the applicants in this case.

Mr. Francis Child (Member of the Passaic Valley Sewerage Commission): Gentlemen, the duty of presenting the questions relating to the engineering features, and matters perchance of most moment, to you gentlemen, will devolve upon our Chief Engineer who from long association with the work, has become perfectly familiar with all its details. Speaking for the Commission, I have this to say:

The lamentable conditions of the Passaic River on account of its filth, have been such, and is such, that, for the last eleven years the subject of some feasible project for the cleansing of the River
11 has agitated the public mind. That the Passaic River is now, and has been for years past, little more than an open sewer, cannot be contested by any one, for the very simple reason that it requires only the olfactory sense of any person visiting that locality to discover that fact. The stench arising from the river is such that property lying along its banks, both on the East and West banks, or above, on the North or South banks, has been so seriously affected that its saleability has been almost destroyed, for factory purposes and, when used for factory purposes, as I myself have heard gentlemen at the head of those great manufacturing industries state again and again, that the stench arising from the river, particularly during the summer months, was so great that their employes, particularly the female employes—and there are a great many women employed in those various factories—was so seriously affected that many of them had abandoned the locality, and others

were seriously ill. These facts none can controvert; indeed, I understand, they are all admitted.

The water of the Passaic River is black; it is black with pollution. Owing to a peculiarity of the river, which may, or may not be known to you gentlemen, in its winding course, and in the tidal effect, a curious phenomenon takes place. The sewage which leaves the upper waters of the Passaic Valley Sewerage District, that is, at Paterson, as has been ascertained, occupy eleven days at times, sometimes even more than that, and other times less, before they are finally discharged from the river. This is owing to an oscillation,

12 resulting from the winding character of the river, and the action of the tidal currents. A little gain is made each day in the downward course of the sewage, which is only overcome to

a certain extent, perhaps a large extent by the out-going tide, and then the sewage is driven back, so that, in this prism we have sewage of eleven days that has been confined there, oscillating backwards and forwards, and with the limited supply of fresh water mingling with it, this great mass of putrescent matter has been there for a period of ten or eleven days. Now, these are facts; there is no guess-work about it; it is the result of experiments. Every measure that could be suggested, offering any reasonable grounds of relief, has been investigated. Every thing, septic tanks, and all the modern improvements of science have been investigated and every one of them has been found unavailable. The reason of it is this: That we have in the Passaic Valley Sewerage District—we have twenty municipalities; you can see that, in order to establish a septic tank system one of two things would be necessary: Either the construction of a great intercepting or trunk sewer, which would gather the sewage at any and all places, and thereafter give the sewage septic treatment or such other treatment as research might show to be best. That is not feasible for the very simple reason that the ground for that work cannot be obtained. Individual municipal treatment is impossible for the same reason. I do not know whether you gentlemen are familiar or not with the locality embraced within the Passaic Valley Sewerage District, but you take, for instance, the

13 municipality after municipality that is so closely connected with the City of Newark, that when you leave the one, here, you can hardly tell when you enter the other, there, these municipalities being, in fact, practically suburbs of the City of Newark, and so it stands to reason that the only method left for us, the only thing we can discover after a research of over eleven years, and examinations and investigations by four successive boards or commissions, aided by the best engineering talent in the country—the only solution we can find, gentlemen, is the solution which is now proposed to you gentlemen, and which will be explained at length and, I trust, in a most satisfactory manner, by our Engineer, who is not only a good engineer, but has the advantage—from long association, of being perfectly familiar with this territory,—with the tidal action and other matters of great interest.

I would now merely call the attention of this Board to the fact that it is not the intention of the Passaic Valley Sewerage Commis-

sion to put into the Bay of New York one more—one additional drop of sewage. Everything which we propose to handle under this project is everything that goes into the Bay to-day, and has been going into the Bay since a time when the memory of man runneth not to the contrary. It has always been done. It goes in in the most offensive form; it goes in after being held back for a period varying from ten to more days. It is proposed—we propose to take this sewage,—remove from it all effluence which is objectionable to the

eye; all that which floats,—all that which is offensive and
14 that which will offer any unsightly appearance in the water.

We propose to receive this in a large receptacle—to lift it there by pumps and send it through a set of tunnels and then, after it reaches its outfall, after being completely screened and everything objectionable removed from it, nothing but liquid—then to discharge it—not from a twelve foot sewer—not from a twelve foot sewer—and you will see the plan which you have before you does not indicate any such thing as that—but to discharge it by means of as many separate pipes as may be necessary—to discharge it so that I think I can speak within reason, that unless—and this is proven by our own experiments—unless a person was informed of the fact that a sewer was discharging forty or more feet below the ground, they would not be conscious of its presence. That is all we say, and as we have reason to say, that this is the greatest reduction—as far as we can ascertain—that has ever been made in the question of sewage disposal. We discharge it through as many pipes as may be necessary, in deep water, distributed over a large area, after careful screening and sedimentation; what more can be done? That we conform to the requirements of the United States statute, of course, is known to you.

I will now present to you Mr. Edlow W. Harrison, and after he speaks, Mr. Rudolph Hering will be prepared to answer any questions which you gentlemen may suggest.

Mr. Harrison: Colonel, and Gentlemen of the Board, I will briefly
15 state the engineering facts which we find are involved in this question, and am prepared at the same time to state the bases of our conclusions as to the entire practicality and availability of the project, and will endeavor to answer such questions as you may desire to put, although Mr. Hering, who follows me, will answer all questions you may desire to ask in this connection.

First, I want to say a word or two, in a little more technical way, as to the methods by which this sewage now reaches the Bay of New York. The sewage which we propose to treat,—the sewage of the Passaic Valley, which is gathered from the towns on either side of that Valley, commencing with Paterson, at the foot of the Great Falls, down to the Southern boundary of Newark,—at Newark Bay.

The Passaic River, in the three or four months of the ordinary Summer of an ordinary year, running from perhaps the beginning of July, to the end of October, has a flow, a natural flow, of not over four hundred and twenty million gallons a day; rather less than that than more. The Passaic River, in an ordinary flood, has a flow of from seven thousand to eight thousand cubic feet per second, or from

five thousand to six thousand million gallons a day. Now, into this River, in the Summer months, with a flow of four hundred million gallons a day we throw the sewage from a population of some six hundred thousand people,—or about sixty million gallons, which is at the rate of a hundred gallons per head per day,—and I think it is right to use the standard of one hundred gallons per head, which

is about the water use of the community. We throw sixty million gallons of what I will call standard sewage. Standard sewage, in the ordinary American community—in some communities it is stronger and in some communities it is weaker than in other communities, but to take the average as a standard, the sewage of the Passaic Valley Sewerage District is no stronger per unit, and no weaker, compared to a similar standard, and we are ready to prove it.

The tide flow of the Passaic is weak during the four months of the Summer. The tidal flow of the Passaic is peculiar during the four months of the Winter, or rainy season—the rainy months. The tide, coming in from the narrows of Newark Bay, meets the fresh water flow of the River from near its mouth; that is, the tidal prism, so to say, is filled with the fresh water from the upper stream, and rises, with the stream, to the salt water dam below. That is the condition during the rainy months.

In the Summer four months, the tidal flow of the River reaches practically to the village or City of Passaic ten or twelve miles above Newark and where the river is about six feet deep and four hundred to five hundred feet wide. A very small stream. Now, the river is narrow; the tidal prism is small, comparatively, to the amount of drainage drained on either side, and the amount of sewage coming in.

Now, during the Summer months, with the sixty million gallons total of sewage coming in, it takes, if a man may state it, from four to eleven days before the sewage deposited in the upper river reaches

the Bay—Newark Bay. This accumulation starts after a rain, and commences to accumulate, so that at the end of a dry period, there are some eleven days' sewage in the river, and an analysis of the river water shows that that is about the fact: That is, that the Passaic River, at the end of a dry period, from Market Street, Newark—that is at the Pennsylvania Railroad station in Newark, all the way up in its tidal course, to Passaic, which is about twelve miles, contains now, in the Summer months, somewhat more of a bacteriological population than the Chicago River did before the efforts were made and the work of constructing the drainage canal was instituted. Now, during that time the sludge deposit is deposited in the river; along come the Fall rains, when, instead of having four hundred million gallons a day, we have, in fact, water enough to fill the prism several times over, and as I have suggested, we have, I would say, from five thousand to six thousand million gallons per day coming down the river,—rushing down in fresher. That is so. This deposit is taken into Newark Bay and there deposited, and you gentlemen of the Harbor

Line Board know who takes it out; the United States has to pay to take it out and dredge the channel of Newark Bay.

Now, as I have stated, all of these facts prove the material effect upon the property on either side of this river; it has been reduced in value. As for manufacturing purposes, it is not sought for. The people who manufacture there don't want to stay, and new people do not come. All of the people who have come into that

territory, all of the purchases that have been made in that particular section of New Jersey in the last few years have been based on the idea that this Commission was hard at work and that a remedy would be evolved in a short time; otherwise they would never think of purchasing, never think of building in the Passaic Valley. I can speak of several industries who have done that, and they have gone there with the belief that, in a short time, the State having taken it up, by this Commission this sewage matter having been taken up, the remedy would be found.

Now, you see, that the effect of this is,—the fiscal effect, not only to destroy to a great extent the commercial and the business interests of the Passaic Valley, and its real estate interests as a place of residence and business, but it is also destroying Newark Bay. They are building up Newark Bay. They are filling up Newark Bay. They are making Newark Bay into a septic tank for the deposit of this sewage, and that is affecting the whole community of four hundred thousand or five hundred thousand more people in the City of Bayonne—in other counties, who are not in this district who are complaining and who are here to-day complaining,—represented here to-day.

Now, I want to speak of a matter in this connection, because it is properly brought before you, which is,—we hear often of how this question can be taken care of by some of the modern ideas in regard to septic treatment and filtration. Now, we have considered it.

The engineers who have charge of the largest filtration works in the United States,—the engineers who have charge of the largest sewage works in the United States, have gone into this subject; they have written about it; you have had pamphlets in regard to that,—they are not considered as part of our case here, but this subject has been fully considered.

In the first place, we have not been able to find a suburban community of this size, spread out as this is and as it will be in the next forty years, where success has been made of the local treatment of sewage. We have examined and looked into practically every sewage plant in all civilized communities both here and abroad, but we have not yet been able to find a plant which we would dare to place in the center of this suburban district, thickly populated as this is, within seven miles of the City of New York, and, finally, we have not been able to find any plant but what within a certain distance, from one-quarter of a mile to a mile, or within that radius, odors have not been found.

We have not been able to find in this community, in New York, Staten Island, New Jersey, or around the territory adjacent to the Hudson, any community which was willing to have a sewage dis-

posal plant within their territory, and I do not blame them. I don't blame any sensible man for not wishing to have it. This whole territory is building up; it is thickly populated, as are all other territories around New York City. In order to take care of this water—this sewage, our opinion is that it will require one thousand acres, and if it was all taken care of by one plant, which would be the sensible way, if that way was adopted, we should have to take out of the area of the City of Newark, one thousand acres. Now, Newark has about eleven thousand acres. In the Southern district of Newark is the great manufacturing and commercial city. The meadows at Newark which, for many years, were looked on as almost valueless, are now very valuable. The developments in the Newark Meadows in the way of manufacturing interests now amounts to hundreds of thousands of dollars, I might say, millions a year, and the future developments are tremendous in their possibilities; they are increasing now rapidly, and the developments now looked forward to are generally now expected will amount to many millions more. And the possibilities of the Passaic Valley is that with the aid of the Government, and with what work has already been done under the direction of your Board, that this Newark Bay, this lower estuary—this lower Passaic, the estuary of the Passaic at Hackensack will become, as with Newark, a large commercial tributary of the port of New York and form part of the port of New York Harbor, and grow side by side, together with New York. Now, we could not spare at Newark, one thousand acres. We could not put up a set of sprinkling filters in the area of one thousand acres taken up by the residence and commercial land of the City of Newark, and, two miles away, is the best part of Jersey City, and with Southwest winds, Jersey City would get the benefit of the sprinkling filters, and with Southeast winds, the City of Newark would get the benefit of the sprinkling filters; and, another most important point, in my idea is, that you will not find a sewage disposal plant anywhere but what the flies are innumerable and insufferable, millions of flies, and, with our present knowledge of sanitary affairs, we know that enormous quantities of flies would be dangerous in the vicinity of a large population. The only City that has tried that on a large scale is Berlin, and Berlin has fifteen hundred acres of sandy land for her sewage disposal plant—they do things differently in Germany—

Col. Ruffner: Did you say fifteen thousand acres?

Mr. Harrison: Fifteen hundred acres; that is, one thousand acres near the city, and public lands in the vicinity—the public lands altogether amount to fifteen hundred acres of sewage farms in the vicinity of Berlin; that is the case with the City of Berlin, but in none of the great harbors of the world, they have not there the great rush of waters we have here; the City of Berlin is far from the sea, and there was nothing else to be done, and even there, no citizen of Berlin, not a scholar, would be proud of the sewage disposal works, but being to a large part established under the well-known economic policy there.

Now, to cure this evil, this Commission, after a thorough study and after a number of the brightest of all our engineers have determined that the best disposition was the natural, first, disposal, due to our situation and to our being part of the harbor of New York, and to the magnificent advantage which this whole metropolitan district has, with the large flow of water and plenty of it, to take care of this project with safety, we finally decided
 22 that the only, best, most economical and also the method in the line of improvement, future improvement, was to follow out somewhat the Boston method, somewhat the London method, somewhat more the Boston method, and with improvements.

Now, we propose to take that sewage down to the shore of Newark Bay, and there pass it through screens and sediment chambers, settling chambers, and remove from the sewage the heavy grit, all the floating particles, and, as you will perceive by our specifications which you have before you, we do not say just how much will be removed; we say "all that is necessary or shall be necessary" shall be removed, so that there will be no danger of an offense arising in the outlet.

Now, there is no question that we can do that. The City of Hamburg does it, there, with a population of over one million. They pass the sewage through a house there, through a house with settling chambers—over screens—the City of Hamburg passes the sewage through screens, then out into a settling tank or chamber eighty feet wide by thirty feet deep, after it passes through this chamber it passes through six sediment tanks, thence into tow-boats, for the sediment, and then discharged into the middle of the river, and the whole river traffic of the City, the ferryboat traffic and general river traffic passes over it; the main ferry station crosses the river, and excursion boat traffic with a station right over in front of the pump house and wharves in front of the pump house,
 23 and the Hamburg-American Line docks, about a mile or two below, are right in the track of this sewer, and you cannot tell there is any sewer in there at all. The River Elbe—

Col. Ruffner: What is the rise and fall of the tide there?

Mr. Harrison: They have a rise and fall of about eight or ten feet, the result being that in order to save pumping they made their sewer so large, with their tide locks, that for four hours each tide the sewage flows up inside and fills up this very large sewer, much larger than ordinary, and they have, from my own knowledge, a great advantage, in the rise and fall of the tide, over what we have on our low level—we do not think it a great advantage, but they do that because it saves pumping, and then the gates open automatically, as the tide goes down and the flow goes out, there has been an accumulation by the intercepting of the flow, causing the sewage to back up in the sewer, which was made larger for this very purpose, which results in this sewage being locked into the large main sewer during the flood tide, so that practically sixteen hours' stuff has to be cared for on the ebb. Our project proposes a very large improvement over this method, as they have to provide for the accumulation

and have made the sewer larger than ordinary for the purpose; while we, however, will not have to hold this tide locked sewage. We improve a great deal, I think, on that; they have a very coarse screen, and the Hamburg sewage is heavy, is very heavy, it is very strong, probably twice as strong as the sewage in the vicinity of New York or in any of our cities.

24 Now, there has been a great misapprehension as to the amount of sewage—or a great misunderstanding, at least, as to the amount we propose to put into this trunk outlet sewer.

Now, I want to say to the Commission that the people of the Passaic Valley are no different than the people of the City of New York, and they do not furnish any more sewage per head than the people of New York; and this mistake may have arisen from the fact that a figure has been used in our descriptions, and in all good faith, fixing the maximum capacity of the sewer at 360,000,000 gallons per day ultimately; that is the ultimate capacity of the sewer, built to take for four or five or six hours, the peak capacity, the peak of the quantity of stuff which must pass through it; you all realize that at certain times of the day the flow of the sewage is much greater than at other times of the day of twenty-four hours, as in every community the same rule answers; now this figure is fixed as the peak of the flow, the maximum capacity of the sewer, three hundred and sixty million gallons; but the average capacity of discharge to-day is nearly—the average maximum discharge is only about two-thirds of that, or two hundred and fifty million gallons, and that is a capacity or average which we estimate will be effective around 1940; that, in other words, is the ultimate capacity. That will include, under the law under which we are acting, the house sewerage, a certain amount of ground water which cannot possibly be kept out of the sewer, and not more than ten per cent, of the trade waste, and when I say trade waste, I mean the total effluence from factories, much of it being clear water; the idea being that the operating of this sewer in a separate system, which is required in all communities, at times, the factory waste will be treated, as it

25 is being treated at the present time and particularly as treated in other communities, and reduced by this treatment so that ninety per cent. of the water will pass right into the river, which, of course, will not injure the river at all. I believe, from our investigation—there have been investigations made in Paterson, N. J., by Mr. Hazen, there is no trouble about doing this; there is no difficulty whatever to do this.

Now, the present discharge is seventy million gallons of sewage; the maximum will be two hundred and fifty million gallons, and not two hundred and fifty million gallons of standard sewage, because the standard sewage—that will be the sewage from about one million and a half of people and the standard sewage of one and a half millions people would not be over one and a half millions gallons, and an additional one hundred millions would be made up of a large amount of ground water, and it is very necessary that there should be a large allowance made, because the Eastward slope of the Orange

mountains is of gravelly formation and contains enormous quantities of underground water.

Now, after this sewage is pumped up, it is sedimented and passed through screens, passed through a settling chamber, and then we propose to send it through a twelve foot channel running under this

head, under pressure, the top of the tunnel being thirty feet below mean high water; now, when I say not less than thirty feet,

I mean, if it should be determined that we will go some twenty-eight or thirty feet below mean high water, it will be in the rock bed, in case you want to dredge where I call the Jersey Flats, the Jersey City flats, it will be in the rock bed, and hence no interference with navigation—

Col. Ruffner: What will be the depth of the top part of the sewer below mean high water as it crosses the Bay down there?

Mr. Harrison: The top line of the sewer will be below the water line—will be at an elevation minus fifty feet below; it must be remembered that in addition the sewer is twelve feet, lying on the bed of the Bay, or if it have a range from twelve to fourteen feet at the outfall, we might say thirty-six feet below low water—

Col. Knight: Below low water?

Mr. Harrison: Below high water. The plan was based on the idea that the requirements would not be over thirty feet below high water in the rock bed in Newark Bay—

Col. Knight: In the Bay?

Mr. Harrison: Yes; in the Bay, and also on the Jersey Flats between Robbins Reef and the Jersey shore; the Pennsylvania dredge is about twenty-five feet, the foundation for the new Pennsylvania yards is about twenty-five to thirty feet. Now, we probably will put that down even lower; the question of whether that tunnel in place shall be minus fifty feet or minus sixty feet has very little bearing upon the case. We may be able to find the rock and

follow it throughout the Bay by going down a few feet more.

What we look for is a way for the tunnel; if the course can be better had down ten feet below minus fifty, I do not think there will be involved much more expense for the shaft, allowing us to keep within the shaft,—there will only be required a little more pressure there with the air; if we have to use air; I don't expect to have to use air only for a very short distance there.

Now, when we bring that out to Robbins Reef, where, in the vicinity of the light house there is now about, by our chart, five or six feet of water at low water, that is nine or ten feet at high water; and there,—or about there (indicating on map) we ask you for a shaft, and we ask you for the right to establish a tank or gate house in which we can control the flow from the tunnel into the discharge pipes although it is probably not absolutely necessary that we should have that; but it would be better for the project, better for the United States Government, better for all interests that there should be something there where the flow of these pipes could be controlled, and in order that they could be controlled in the flow; we would then be able to throw a larger velocity through any one of the pipes or in all of

them for cleaning out and scouring; also, in case of a repair to a pipe, we would be able to shut it off there without going into diver work.

You already have an obstruction to navigation on that reef; a Light House; the Reef was deeded by the State of New Jersey to the United States, during the administration of Governor McClellan and the United States holds it for light house purposes; the State reserved in the deed the right of reversion if case it should be abandoned for lighthouse purposes and any use for any other purposes.

Of course, the Commission acts under authority of the State, and have the right to the use of any such reversionary interest of the State or rights of the State in any way. Now, I am well aware, the Commission is well aware, that probably the question of the location of this building—this structure is a small, common structure, architecturally—as it is contemplated to put upon this rock as a shaft and pump house—we know that the question of its location there on that reservation does not, I believe lie with the War Department, but that the final location would probably lie, we understand, with the Department of Commerce and Labor and as that Department requires; but the question of obstruction comes to you; that is the reason we apply to the War Department,—in regard to the obstruction. Now, if the Department of Commerce and Labor don't see fit—we think it should be as near the light house as possible,—in fact, my own opinion is that if we put up a proper kind of a structure the upper part of it could be used for light-house purposes instead of the small light house there as it is—the light-house there now is forty feet above high water; but, if the Department of Commerce & Labor don't consider that a proper place to put it, three hundred and fifty feet from the light-house we are in the lands of the State of New Jersey, and, therefore, we ask you for the right to put it there on the same reef, about the same height or elevation, about the same part of the rock—we ask a right to put our shaft there.

Now, from this shaft and from this gate-house, which is practically the end of the tunnel, we propose to extend into the distributing ground, a series of perhaps four, we will say, four hundred four foot pipes; they will be rivetted; they may be rivetted steel, may be cast iron,—but we are not determined yet what will be the best use. They will, of course, have flexible joints. They will be laid in a shallow trench on the bed of the Bay. They will extend out to a depth of forty feet where there is water forty feet deep, on a forty foot parallel line vertically below high water, and there we will commence to allow the sewage to go out, and we propose then to diminish the pipes across the channel, or into the channel, all within the limits of the State of New Jersey, sloping the fall of the pipes from 40 to 60 or 70 feet, and we propose to have openings in these pipes, in the several pipes, perhaps fifty or sixty openings, or as many as may be necessary, and the pipes, with these openings, will be distributed over as large an area as necessary so that every part of this filtered sewage, as it comes out from the pipes, will almost immediately be diluted with a proper proportion of Bay

water in order that the sewage may be thoroughly dispersed and that there shall be no offensive conditions arising.

Col. Knight: Do I understand that those pipes that you say you will have come down a slope—when you speak about sloping,
30 do you mean that the pipes will slope downward from the mouth of the tunnel for the length of the pipes, which you say is to be about 400 feet?

Mr. Harrison: When I spoke of sloping down, I referred to having the pipes slope downward toward the bottom of the bay, from a depth of forty feet to a depth of perhaps seventy feet, depending on the depth of the water.

Col. Knight: You propose to continue the pipes down to a depth of seventy feet, on a slope?

Mr. Harrison: They will be put at a depth of forty feet, and slope downward, with the several openings so distributed as to secure the best results in dispersion.

Now we do not limit ourselves in our specifications as to the practical plans; we do not limit ourselves, nor in the contracts which will be made with the municipalities under the law to how much that area of distribution will be or how many pipes may be necessary or how many openings may be necessary; we say we will give as many openings and over as wide a distributing area so that the volume of water in the Bay, flowing from forty feet to seventy feet deep will be sufficient to dilute the sewage as quickly as it comes and we put it out in small units to mix it at once with the water of the Bay. There we get the ideal practice. We get a great volume of water in the New York Bay; the great trouble in all sewage systems is the need of mixing quickly the sewage with the diluting
water,—the oxidizing water. Now, in regard to that thing,

31 I want to give a few figures which are the result of our investigation and on which we base part of our argument; we believe and we know that they are correct.

And, first, I want to remind the Commission that the standard of dilution for Chicago was one to twenty; one part of sewage to twenty parts of lake water passing through; that is the standard,—one to twenty, or one unit—or four cubic feet per second of flow for each one thousand people—the ratio of the diluting water as to the population for the sewage—

Col. Knight: One moment; is the character of the Chicago sewage that you are going to refer to now, of the same character as will come from your effluence there?

Mr. Harrison: Well, leaving out the stock yards sewage, the character of the Chicago sewage is much stronger, as much of it is not screened—

Col. Knight: That is what I wanted to develop.

Mr. Harrison: Let me say, in regard to the screening proposed,—from the very best authorities, when we have screened sewage and when we have deposited we have thus reduced its pollution—its powers of pollution—power of offense so that the oxygen required to entirely destroy it is fifty-eight per cent of the normal; that is, if it takes one hundred per cent. of oxygen—that quantity of oxygen to

destroy the power of pollution of ordinary sewage, screened sewage, in the way we propose to put it through, as sedimented sewage, it is about 58 or 58 and a half—fifty-eight and a half per cent. of oxygen will do it; that is, we practically take out about forty per cent of the putrifying substance. I give that on the authority of the English Royal Commission, Hall and Gibson, authorities on the subject.

Now, we will say that Chicago is as one to twenty;—Milwaukee is one to twenty-six,—in the improvement of the Milwaukee River. In the English Royal Commission, the result of their experiments show, as applied to American sewage, that it seems to be that the dilution of one part of sewage with fifty parts of ocean water—Bay water—salt water—sea water—one to fifty, with absolutely no knowledge whatever that anything was being put into the water—I mean that the sewage may be taken care of with no knowledge to the senses or to the observation that it was going into the water at all. I only give this as a sort of measure or scale by which to figure the figures we propose to give further on.

Now, from experiments we have made, only one or two, one which I happened to have right at my hand last night, an experiment made at ebb tide at Robbins Reef, in the Summer; we found at the surface eighty-eight and five-tenths per cent. of the normal quantity of oxygen in the Bay; that is, that the pollution first of the whole of New York, the whole of New York island, the City of New York, the pollution coming through the Kills and mingling with the waters of the Bay had not cut that oxygen down only eleven and a half per cent. Now the authorities are all agreed that water, as long as the oxygen is not cut more than fifty per cent. the sewage can be put into the river water without offence to be taken care of. Of course, I am not making that as a statement of fact. I do not want to go too deep into this thing; I am only stating points upon which we base things. Now we find—at a point, you asked me in regard to the constituents of sewage. The speaker is asked for a comprehensive view of this. Perhaps I am going further than should be done, after having stated to you, and I am willing to prove it, that the sewage will be liquid; we propose to discharge liquid sewage into New York Bay; sedimented and screened, and under section 1307 of the River and Harbor Law, liquid sewage seems to be separated from the interdicted articles which are there legislated against being thrown into the bay or into United States waters.

Now, there is a question raised that the sewage of the Passaic Valley is particularly bad. That there is something in the sewage of the Passaic Valley, it has been alleged, different from other sewage; something that will rot timber, and tear out the bottoms of ships and things of that kind. Now, these are the facts, and these, presumably, because they are so manifest on the Passaic. Now, the facts are these: The population of the Passaic Valley as compared with the population of the rest of the district draining into New York Bay is as one to seven and six-tenths.

Col. Knight: One to seven and six-tenths?

Mr. Harrison: Yes; to the population of the one, the population of the other sections in this district is as one to seven and six-tenths.

Now, the manufacturing establishments liable to pollute the
34 streams, I have taken from the United States Census; the manufacturing establishments which are considered by scientific men—sanitary men—as those of a class which furnish large amounts of waste or polluting waste such as breweries, silk mills, dyeing establishments, leather tanning industries—I can give the whole list if necessary—any sanitary man would be able to pick those out at once himself,—they are in the ratio of one to sixteen as to number,—that is, for sixteen of such establishments in the territory including Hudson County, Jersey City, Hoboken and districts draining into New York Bay, direct, to one establishment on the Passaic. The capitalization is as one to seven; that is, our establishments are larger. The labor is as one to four. That is, we employ somewhat more labor. The value of the product is as one to seven; that is, the capitalization and the value of the product are practically the same—the product and the capitalization; the population, the labor, is a little heavier, we need a little larger number of laborers to an establishment in the Passaic Valley. The number of establishments are greater in New York, Brooklyn and the districts around the Bay, directly draining into the Bay, and there is nothing in that to bear out the idea that there should be any difference at all in the sewage. Now, those are the figures,—the statistics in regard to it.

Now, when we come to an examination of the sewage, and we have had hundreds of examinations of the Passaic River, and there
35 has never been an examination which resulted in finding anything different in Passaic sewage from the ordinary sewage of American cities, or New York, or the ordinary communities around here, except this, it is darker and it is thicker because our diluting water is so little. It goes into a stream of very little water. If you take a white boat up the Passaic River in Summer and you will probably have a black boat when you come back, but that can be cured by dilution.

Now, the next point in regard to that sewage, we propose,—the methods we propose are so very far in advance of anything that it is away and beyond anything that is being done now. You have this sewage, as the Jersey side of it comes off the Kills now. There is practically nothing comes down Arthur Kill; the current is down the Narrows into New York Bay.

Now, I had an analysis made of the waters of the Newark Bay on October 23rd of this last year; that was the end of the dry period—the waters of Newark Bay at the Central Railroad draw-bridge, near Bergen Point, in the channel there, in the swiftest part of the channel, at ebb tide, towards the end of the ebb; the samples were taken and the analysis was made by Professor Stillman of Stevens Institute, and showed Free Ammonia seventy-seven-one-hundredths parts in a million; Albumenoid Ammonia seventy-four-hundredths parts in a million. The analysis of the Ammonia in New York Bay as made by the Pollution Commission of 1904 and

others made by the Commission on a New Water Supply for New York, showed the average of Free Ammonia, commencing at Pier

One and running down in New York Bay as one hundred
 36 and twenty-nine-thousandths of a million, and of the Albumenoid Ammonia, one hundred and forty-three-thousandths of a million. That is, on October 23rd, of this year, after this dry period, the result of the accumulation of sewage in the Passaic River and Newark Bay has made the discharge of waters of and from Newark Bay into New York Bay contain over six times a greater quantity of ammonia and amount of sewage than the normal waters of New York Bay. That is, the water that is going in now, from Newark Bay—going in in the the Summer—not now, because we have had rain,—the water that comes into the Bay in the end of the Summer from the Passaic River into New York Bay has nearly four, five or six times higher standard than the waters of New York Bay as determined by the Pollution Commission, and our figures, as determined by this Commission, and I must say the facts since ascertained seem to bear them out. That is, when the waters of the Passaic River, by way of the Newark Bay, strike New York Bay, it immediately reduces the conditions of New York Bay, and the reason for it is that that four or five or six times higher standard of ammonias which is accumulated coming down to the Bay shows its effect on the normal waters of the Bay, and notwithstanding this was the condition there through, a simple analysis it is indicated what an enormous purification is shown, and it shows that even lying there in that dry period, and without getting the benefit of that dilution which the volume of water in New York Bay provides, simply from purification, septic tank action, still when
 37 it got through from the Passaic through the Narrows, it has twice—it has, not twice,—it has as much, ammonia per unit in Newark Bay as there is in New York Bay.

Now, that brings me to the condition of New York Bay as we take it: We find—the Chicago River standard—in purifying the Chicago River canal, the ammonias are due to that admixture, would be six hundred and ninety-seven-thousandths parts in a million of Free Ammonia, and one hundred and thirty-nine-thousandths parts in a million of Albumenoid Ammonia, that is, fresh, just as it comes in—of course, Free Ammonia passes into Albumenoid Ammonia in time. By this Chicago River standard, the Newark Bay had more free ammonia on October 23rd than the Chicago River has, purified. That is, Newark Bay has passed the line of four cubic feet per thousand. When it goes to the condition of fifty per cent. free ammonia, it will begin to give out an odor and may become a nuisance.

Newark Bay, away down to Bergen Point, with the pollution passing down to New York Bay, in only normally polluted by all the sewage of New York, one-fifth the Lake Michigan standard,—the standard of the Chicago River: That is, New York now, taking the sewage into it of five or six million people could take five or six times as much sewage, properly diluted, properly spread and properly brought into contact with the waters of the Bay, could take

five or six times the pollution it now receives before it reaches what every engineer in the United States pronounced the proper thing, to be the best thing, for the City of Chicago, and also pronounced the most capable of taking care of the Chicago River so that there should not be a nuisance arise. There, the point is this: We propose to put only one day's supply into the Bay. Each day by itself, that supply can be reduced,—of putrescent matter somewhere around forty percent. No more. Nothing to make a deposit. A liquid. We propose to deliver it over such an area that just as soon as it leaves the pipes it immediately comes in contact with a flow, of water in the large prism above, and in regard to that flow, of the tide in the prism, taking the map as it shows there (indicating), and allowing the sewage in there to be going out, as spread out at about an angle of sixty degrees and coming up like smoke, the water of that prism, moving along at the rate of one and five-tenths feet per second, which is about the average tidal flow in New York Bay,—the mean of the tidal flow, the tidal flow in that prism per second is sixty-three thousand cubic feet per second; that is, the prism above or across these pipes, flows at the rate of 63,000 cubic feet per second, and the discharge from the pipes,—the ultimate discharge, in 1940, our discharge then is two hundred and twenty-five feet per second,—the present discharge of it if in operation to-day would be one hundred and five cubic feet per second now, with sixty-three thousand cubic feet of tidal water per second to receive it.

One other point I want to make, and then I am through: The tidal volume, on the flood, in New York Bay, is said to be twelve thousand seven hundred and four million cubic feet, or about five hundred and ninety thousand cubic feet per second,— in six hours, twelve thousand, seven hundred and four thousand million cubic feet in six hours, one flood. There has been a considerable discussion as to how much of that is sea water. Now, the New York Pollution Commission here referred to—they say they could not find it—now, I will ask them to look at their own report. They made a very careful examination and reported on the subject—that the bacteriological tests at a number of piers, commencing at pier No. 1, of the Iron Steamboat Company and going down to the Iron Pier at Coney Island—they started, the Commission started at the last hour of the ebb, on June 11th, presumably a warm day; they took bacteria tests at Pier No. 1, opposite Robbins Reef, Liberty Island, Gravesend Bay and in the Narrows. The report of the Board or Commission, in the first document they state they stayed there during the day and came back on the end of the flood, the last hour of the flood, in the afternoon. They took the same test of samples. The report of the Commission shows (Mr. Harrison is here referring piece-meal to the papers). The report of the Commission shows that they brought back fourteen and a half tests (they note the one-half test)—the report of the Commission shows they came back on the flood and they found one-half of the bacteria—just about one-third to one-half the quantity of

bacteria from the samples that they found when they went out on the ebb.

Now, during that day, they were away when New York Bay was tide-locked—they went down the last hour of the ebb, before the flood had closed the sewerage in—during the time it was tide-locked—the sewerage went out, one-sixth of the total
 40 sewerage in New York Bay, going into the Bay, bearing in it million of bacteria, the afternoon a warm one, in June, and the records of the Commission show that the water they took up was clear, clear, without stench, with practically plenty of oxygen in it; there was, also, a certain amount of Albumenoid Ammonia and Free Ammonia—(Referring to book—report—in making these remarks). That is all there (indicating)—increase in bacteria—whole afternoon—increasing coming back—found only one-half the bacteria they found in the morning—at the end of the flood—all the day the bacteria had been pouring into the river and Bay from the sewers, and nothing going out.

What is the answer? What is the best answer, with one-half of a flood tide, at least, coming up? I submit that the tide that comes up is ocean water; there is no other change—one-half ocean water—I place no significance in the quantity of bacteria. Now, we will take the bacteria as so much aniline dye found here, let us suppose that they went out and placed a certain amount of color in the water, distributed in New York Bay at the end of the ebb tide, and came back, and found one-half, on the end of the flood tide. What is the fact? The clean ocean water came in up there, dispersing the color, cleansing the source.

They say their figures there were surface indications: They know well that under the surface of the water there is double the amount of salt water at a level of forty feet below the surface of the river, say at 39th Street, where, below the surface, and again at 44th Street,
 at about 40 feet down, we have found twice as much salt
 41 water as at the surface. This water at the surface contains more of the albumenoid ammonia, more of the factory waste, more of the fresh water, while below the surface there is less factory waste and a larger amount of ocean water; fifty per cent. of that water, at least, which came in on the flood tide into New York Harbor, is ocean water.

Looking over the report, you will find no difference in the albumenoid ammonia, practically no difference over several years; you will find no difference whether ebb or flood; you will find very little difference in the bacteria found, or a reduction; and still the whole thing is, that the standard.—the standard of purity of New York Harbor, the standard and measure of what New York Harbor can do to sewage, it means that New York Harbor can now, and is now taking care of a population of six million, with a result in impurities, in the suspended impurities, of about one-fifth the standard which is accepted by all engineers and all sanitarians throughout the world as being perfectly safe. That is the standard, day and night, Winter and Summer. It may in Summer work do somewhat, but not in Winter. In their report (Referring again to papers) they

have shown some figures, that is that for four or five months of the year these waters draining into New York Harbor, and found in New York Harbor, have as much as thirteen-hundredths of a part to the million of ammonia. The standard which is safe runs up as high as seven and three-tenths of a part to the million. Chicago can go along with seven-tenths of a part to the million of free ammonia and a nuisance will not arise. In New York Harbor

42 the extreme has been thirteen-hundredths part to the million as compared with the germ condition incident to seven-tenths part to the million of free ammonia in Chicago, and this extreme in New York is taken from the surface of the water. If you will take all of the sewage in New York out of the pier end sewers, and take out of it all the matter in suspension, and put it into a liquid form, and bring the sewage right up through the water from the bottom, making an admixture all the way through, that condition will not be found. The trouble with New York is they should adopt this plan, we believe, of screening and sedimenting of the sewage, putting only liquid sewage in, and putting it in at the bottom, out of pipes with a large number of openings, so that the water, coming in contact with the liquid will quickly disperse it. If that plan is adopted and carried out for the whole city of New York, the Bay will take care of the sewage of forty or fifty million people, according to the engineers, who practically agree on that question.

Col. Knight: The application of your Commission before the Board now involves the question of sedimentation?

Mr. Harrison: It does.

Col. Knight: And of screening?

Mr. Harrison: It does.

Col. Knight: There is nothing before the Board to show how you propose to do that, nothing to show what your interpretation is of "such screening as may be necessary"? Are you prepared to give us more details?

43 Mr. Harrison: I will leave that question to Mr. Hering.

Col. Knight: It will be adequately determined?

Mr. Harrison: Mr. Hering will answer you in respect to that.

Mr. Dean: I would like to ask some questions of the speakers, and would ask whether you consider it more convenient for me to ask them as each speaker concludes his remarks?

The Chairman: You will be allowed to question them at the end of the presentation of the petitioners' case.

Mr. Dean: I would like to have the petitioners state here certain information concerning the sedimentation and screening which is not set forth in their specifications and which we have been unable to obtain.

Col. Knight: I think it would make the matter briefer to have the questions come at the end.

Mr. Hering: I propose to be brief and merely refer to some of the essential matters in this proposition.

Some years ago, I was first brought into contact with this proposition by the State Sewerage Commission of New Jersey who had then under consideration the purification of the Passaic

River; and there were presented to the Commission of which I was a member, a number of plans contemplating the purification of the sewage of the different municipalities. We considered these reports and plans and propositions very carefully and we came to the

44 conclusion that in our opinion none of them would answer the purpose for the future, and we could not recommend any of them. So, then, the question was, what shall we recommend? and, after consultation, we made a new proposition to the State Sewerage Commission, and recommended the disposition of the sewage of the entire Passaic Valley, in a proper manner, into New York Bay near Robbins Reef, where the present Passaic Valley Sewerage Commission proposes to discharge the same.

At that time the methods of sewage purification had not developed as far as they have developed to-day; in fact, they have not reached perfection yet, and I think—having been myself three years ago in Europe, and this last Summer in Europe, where they are ahead of us in this particular branch of engineering.

We found that not only the expense of the individual purification schemes would be great, but we were afraid that as this population grew, it would encroach upon the territory which, unquestionably, is more or less offensive according to all methods that we have to-day, unless you provide a free territory around the same so that we felt that we had to give a positive recommendation, and I mentioned it.

Now, then, the question was to satisfy ourselves that that was the right thing to do, and that it was better than any of the other propositions that had been made. I had the honor again to be connected with this matter, as one of the engineers of the present commission,

45 and had the instructions to revise the entire question as if it was a new one, and see what could be done. That was particularly proper in view of the fact that the methods of sewage purification had unfolded and developed, and that the conclusion had been better than seven or ten years ago. Another study was made very carefully, and I also examined personally the various works in the world, Europe and here, with some of which I am connected,—and, again, the same conclusion was reached.

Even those modern methods of sewage purification, which are much cheaper than former methods and can be controlled better, and do not require so much territory set aside for them, have figured out more expensive than the present proposition and, in addition to that, they practically set aside an area, I believe, of about one hundred acres, or something like that, somewhere in the Newark Meadows, being the only available territory left for sewage purification,—set aside that territory, and it will never be an assurance, from our present knowledge, that it will not be objectionable within a certain radius around the Passaic.

Our provisional thought was that possibly a quarter of a square mile would practically have to be devoted to the project, or a reservation of perhaps more territory. These calculations were made on the very latest and best experience in Europe. We have only a few plants as yet in this country, in operation, on this latest,

best method. Small plants, too. Europe has had some for ten years, so that we know what it is going to do,—know what it does, and we can, therefore, when we compare the different sewages, and differing conditions, take them into consideration, we
 46 can tell pretty nearly what they are going to do in this country; and all that information was utilized to test this question here for the Passaic Valley Sewerage Commission.

Therefore, the Bay disposal was again recommended, and is now, and I would like to say here why, and why it is better than the others.

You know, of course, that it means disposal by dilution, and the question is, what does that mean?

Some twenty years ago I was engaged by the City of Chicago to determine what that City should do with her sewage. Twenty-one years ago. They wanted to purify it, and yet that subject was one that was very doubtful in its effects and so on. Very large expense. They had an opportunity, which very few cities, if any other, has, of diluting their sewage and discharging it away from Lake Michigan, that is, into the Mississippi valley, and, therefore, preserve the water supply, which must be taken from Lake Michigan, there being no other available supply. Now, then, this canal which was to take the sewage, diluted, into the Mississippi Valley, went through rocks for more than half of its distance; it was very expensive, and it was necessary to find out how large must you make that, because every inch in width would mean a great deal of money in added expense of installation; so that all the available information, from Europe and America was brought together to find out what effect *is there*

by diluting the sewage, and, to be short, the result was that
 47 a certain quantity of water, passing by and taking the sewage of a given population, will so dilute the same, and mix it and carry it off, so that the oxygen in the water will purify that sewage and render it, after a due time, not at once, but after a due time, render it innocuous.

Now, the figure, if I may state it, was three and one-third, about three and one-third cubic feet a second of flow was necessary to so dilute the sewage for one thousand people. That was the result and, on that basis the canal was built, and it is there to-day; and, now, what do we see in that canal? We see no pollution. We see that even though the dilution to-day is but two and two-thirds cubic feet per second per thousand persons, therefore less than the amount we specified, there is no offense, and that without question that big water way is going down from Chicago to the Mississippi River, and there is no offense. That is merely the result of data that was obtained from Europe, from Massachusetts, and other places in this country at that time, which enabled the Commission to make the recommendation, and it has turned out as it was *accepted*.

Now, we have a great deal more enlightenment now on that subject, both from Europe and here, and I will say that the imperial government in Germany possessed a lot of cities on the rivers in Germany, who purified sewage, before discharging it into the rivers, but it was a very expensive operation, and the consequence was that

all of the cities got to work and found out how to purify sewage, and the result was that they found it was practically impossible or, better, unnecessary. Reports were made to the imperial board of health and the imperial board of health changed its dictum and now desires that a certain amount of water must go down those rivers to dilute the sewage of a certain population. It has thrown away the Chicago standard, and for good reasons. But the sewage must all be screened and settled, but nothing more. Now, all the cities are doing that: Along the Elbe, along the Ader, along the Rhine, and other cities; that is, they are not all completed,—the works are not all done, but they are going on in that direction. This was not an unknown matter to some engineers, and, now, every engineer that has studied this matter and had some experience in it would say that that was the way the thing was going to go eventually, and that the imperial German board of health was executing something which was altogether too expensive and unnecessary at the present time.

For that reason, the specification for this Passaic Valley Sewerage District sewer was made so that the sewage shall be screened and then it shall be settled, because, the first Board, of the first Commission said: "If you want to put this sewage into New York Bay, do you want to put it in like Hoboken, like Jersey City, right along the shore, or, how? I said, personally, I do not think that that is proper, because it is all one grand metropolis, and I should suppose

that that would be very objectionable, in fact, I think everybody would grant that it would be objectionable; therefore,

I proposed the method that you have been told about, at the time. Better than Hoboken discharges its sewage; better than Jersey City discharges its sewage; better than New York City discharges her sewage.

Now, here are the chief differences, why I believe this is the best system of sewage disposal for the territory under consideration. In the first place, the sewage has all its floating matter taken away at the pumping station; in other words, the sewage is screened—

Col. Ruffner: Won't you please explain that to the Board?

Mr. Hering: I was just coming to it: The screening is done in a number of ways in Europe. We have got about a half-dozen different plants and screens, one particularly nice, I was looking at, this summer, being from two millimeters to an inch, two millimeters is about one-sixteenth of an inch, and experiments have been made as to how much can be screened out and as to what cannot be screened out, and you will naturally see that by screening you can get out all the coarse, floating matter you do not wish in evidence, and we do not need any evidence about it, it seems to me that the chief objection we all find in the New York sewage, which is not screened out, we see it coming down, floating down both rivers; we see it, and we know it is sewage, and we don't like it; that is the reason for screening the sewage in Europe, almost everywhere, that is the reason we contract to screen it here, so that none of it will float down the water any more.

The next thing is that we take out the sediment, in order to prevent this sediment from depositing in the channel and

filling it up. This was done after a consultation with General Roberts and General Raymond, of the Army, and no details have been made as to just how much sedimentation should take place; but sufficient to satisfy whatever demand the United States Government may make. Now, that is proper, so that those two things are out. Then, thirdly, the sewage is not discharged at the shore, like that of Jersey City, or New York and Brooklyn, but nearly one mile from shore, and, for that reason, the effect of the New York sewage going down along the piers, which is taken up by the same thread of water, and where there is, an accumulation, instead of dispersion, does not take place,—it is out in the middle of the Bay, nearly a mile from the shore.

The next point is that the sewage is discharged forty feet below the surface. Now, that is a very important matter,—in fresh water, and, also, in salt water. You can readily see that when the sewage is discharged down, far below the surface that, as fresh water, it will rise in salt water, it will rise up towards the surface if left alone, and the surface gets quiescent, and it may be apparent there. This is so in Boston: it is so in many other cities where they discharge large bodies of sewage in salt water some distance below the surface. Now, I do not know of any place where it is discharged as much below the surface as it is intended to be here, nor in the way it is intended to be, and as it ought to be, but my experience, I will say a little experience I had in Honolulu helped me somewhat in this conclusion. The experience generally in Europe

has, as elsewhere, shown that this sewage will be dispersed as it rises, the only question is, into how much water shall it go,—how much sewage into how much water, and, as a provisional only, I assume, for the case here, the same dilution that I recommended to Chicago, which is provisional, knowing very well that this is salt water and Lake Michigan is fresh water, but it gives a foundation, and I am not certain as to just what is the actual best dilution because there seems to be no careful investigation on that subject as yet, and it is not very simple or easy to make. For that reason, I suggested a number of small outlets,—think the number was four hundred small outlets, to be placed upon this sewer, across the current, so that the water, moving into the Hudson, and into the rivers and Bay and out, would pass those openings and take from each one an amount of water just about equal to that which renders the Chicago Sewage entirely inoffensive. Therefore, it was necessary to issue the sewage in small amounts in small pipes, across the current and, as the report which you have shows this method has been adopted by the present commission; it is a dispersion of the sewage better, I think, we may say, than in any other city in the world except possibly Hamburg; but that is a very small affair, and is not nearly so effective as this, although that is the best that could be done there.

In Hamburg, the sewage is screened and settled the same as here and is discharged into the Elbe across the current just as is proposed here, with a number of small openings just as is proposed here, although there, perhaps, not so thoroughly

worked out as may be done in this case under different and somewhat better conditions. There, what is the result? All of the Hamburg sewage goes out there; you don't see it at the surface; ships go back and forward over the place where, thirty feet down, the sewage is discharged, at a depth of thirty feet; all the vessels pass there and see no objectionable results in the water and the people are perfectly satisfied. The tide there is about six feet, it runs up and it runs down, but I don't know how many, perhaps ten, miles below this City, not more than ten miles below, in the current of the stream, the City of Albany, a large City, with a large population, takes its water supply out of the Elbe, into which the sewage of the City of Hamburg has passed under the conditions described, it takes its water supply, filters it, and, at the time when the cholera was in Hamburg, when the cholera sewage went right into the river, therefore was taken up by the intake of the Albano water works, yet there were no cases of cholera in Albano excepting those who drank water in Hamburg,—one of the most remarkable cases on record in the world; they drank that water, and they drink that water to-day, and they do not object to it, and they do not think of getting any other source.

Now, I believe, Mr. Chairman, that that is all I wanted to say about the method of sewage disposal, which I thoroughly believe is the best that can be made, and I only wish to say one more thing: I hold the position of consulting engineer to the Board of Estimate and Apportionment of New York City and I would not for a moment allow myself to say a word which would in any way affect the best interests of New York City, and I believe that there is no way to dispose of the sewage of our neighbors that is better than the one that has been recommended.

Col. Knight: Will you kindly go a little more into detail as to the passage of this sewage backwards and forwards with the tide? How far down stream would it go from your effluent there?

Mr. Hering: It would, naturally, go as far as the water of the river would go during the incoming tide, and then it would go back and down as far as it would travel.

Col. Knight: Have you determined any limits in any of the reports you have submitted?

Mr. Hering: No limits of distance, because it don't seem to us to be very essential, for this reason: that the sewage is diluted, so that it is not feasible—I want to state one thing, please, which is a proof demonstrative—to demonstrate just what I say, some might say, oh, that is all very good reasoning, and perhaps a good deal of theory about it, and in these questions it is well to have a practical demonstration, so I urged that a practical test be made. The Commission consented, and we procured a barge containing about thirty thousand gallons of fresh water, and representing sewage, and so that we could see the same, we put into it enough red aniline

dye to make it blood red, so that you could see the coloring plainly, well it was just like blood. Now, we went down to the point where it is proposed to discharge this sewage, this side of Robins Reef, and at a time when the tide met,—that is, I wanted

to get there at such a time when the water was as quiet as possible, because then it is very clear, and it seemed to me that when the water ran from four to five feet per second you would not see it very far any way, so I wanted the water as quiet as possible. We therefore discharged this thirty thousand gallons of adulterated water at the time when the tide went least—the velocity was least, and we found as follows: We found that when it was discharged ten feet below the surface, you could very soon see this blood-red water at the surface; naturally, that could be expected; the fresh water came up; it was lighter than the salt water. Then we discharged it twenty feet below the surface and we had to wait some time, and then it came up, some of it, but very much dispersed and not so vivid. All the rest of the water we discharged at thirty feet depth and although we were around there over two hours we never saw anything at the surface at all, not a thing of this red liquid.

That was a very crude experiment; it was really intended only to see how it would act, in order to get some practical details, and so the Commission consented to making that test with the expectation of some day having a test made that might prove it more

thoroughly so as to be able to say that with this Passaic
55 Valley sewage, discharged out of a six inch pipe at a proper depth, at presumably as nearly as possible the real conditions, and the quantity, the width of water which was to dilute it would be about the same as in this project, although the details have not been studied out, as there has been no opportunity for doing it. I merely want to say that this proved that this assumption is correct in practice as well as in theory, although I do want to say that was theory in a sense, not being actual sewage, but it is not speculation, because it is not—there is enough evidence given here as to the practice at Hamburg, Germany, as well as in our own country to remove that from any charge of speculation whatever.

Col. Knight: Another question, Mr. Hering: As to the proportion of solid matter in sewage, the proportion you will remove by screening; the proportion that will still remain subject to sedimentation?

Mr. Hering: The proportion which can be screened out varies, of course, with the size of the openings between the pores of the screen. Now, very elaborate experiments were made in the sewers of Berlin on the subject of screening and with different size mesh, and it was found, with the ordinary screen, going down to about a centimetre in opening—a centimetre is about a half inch, about a half inch opening in mesh you can get out more than fifteen per cent. of the suspended matter, but you get out everything that is larger than a half inch. The other suspended matter is very small and remains
in the water; it is what renders the waters dark, but it is
56 so small,—the particles are so small that they cannot be seen as particles, their presence merely serving to darken the water.

More recently, experiments have been made with screens down to a still smaller size, down to a millimetre in the size of the pores, and, there, a much larger percentage was taken out, I believe about one-quarter, but the three-quarters remaining in the water corresponds in size and effect to what is in the water after a rain, causing the water

to look brownish; it is so small as to be almost impossible to screen out with any contrivance of this sort we have been describing; it has to be filtered out; but that would go through the screen, even down to a millimeter size of mesh; but there is nothing, that amounts to anything, in the sewage in a sewage system such as this we contemplate, that is not to take in, after it is completed, any storm water or any surface water, which is objectionable, all the larger particles, all that floats, has been taken out—

Col. Knight: You still have not touched the point, Mr. Hering, you commenced in one particular, but you have not developed it; my idea was to get your idea of the proportion of solids to the amount of sewage,—then the amounts removed by the different stages?

Mr. Hering: This is the figure we usually use; of course, our sewage is very much more dilute than that of Europe, and we must take that into account. We assume that there is one part of solids in five thousand parts of water, about. But the solids are very small; of course, everything that is solid is included in that.

57 But sewage, you know, consists of, we will say, organic matter and mineral matter in about even parts and, together, they only amount to about one, that is, to about three or four parts of water to one part of such matter in the sewage; that is the ordinary house sewage, in that composition.

Col. Knight: Of that, you will remove, by screens, then, fifteen to twenty-five per cent?

Mr. Hering: Yes; and that means, that we would remove one hundred per cent. of the matter that you would see floating.

Col. Knight: Then, what remains after the sedimentation? That would also take out a small part of the grit that screening had not?

Mr. Hering: That would take out the greater part of the grit that screening had not; that takes out the grit; whatever will deposit. Now, that is a subject that has not been studied yet very much—

Col. Knight: I noticed you leave it vague.

Mr. Hering: It is left vague because it takes a great deal of study and expense to find out those details; they simply have not been attacked yet; it was the understanding, of course, of the Commission, that whatever was necessary to be done would be done. Rough estimates have been made; I cannot tell you just what those rough estimates are, any more, but sufficient, I am quite sure, to cover whatever sediment would come in.

58 Col. Knight: And when the application is made for a permit, it includes sedimentation, simply to include things that may arise and have not been accurately determined yet?

Mr. Hering: This quantity is not accurately determined yet, but the fact that sedimentation shall be there and the basins shall be large enough to allow the velocity to be small enough so that matter of a certain size will deposit,—that has all been determined. You are aware, perhaps, that the matter carried in suspension by water, given a certain velocity of the water, if you reduce the velocity, you cause the suspended matter to be deposited; it is an entirely fixed ratio.

Col. Knight: Well, the screening station here, the location of the

pumping station, is right on the edge of the water? (Referring to map.)

Mr. Hering: Yes.

Col. Knight: Now, where do you get any sedimentation basins—(referring to map) where are they to be arranged for between that point and the point of discharge?

Mr. Hering: It would be arranged above the pumping station—the screening and gravity basin would be above the pumping station—

Col. Knight: So, your screens and gravity basins are away down there (indicating on map)? They are supposed to be there (indicating) before you come to the pumping station?

Mr. Hering: Yes, sir.

Col. Knight: Now, just whereabouts, in this route, whereabouts is that development—the commercial development that the City of Newark proposes—the Canal?

Mr. Hering: I cannot tell you that.

Col. Ruffner: I would like to ask you if you propose to do that small screening at all before you reach the pumping station, or only there?

Mr. Hering: Whatever screening is necessary and whatever disposition is necessary to facilitate the pumping that is to say, not to injure the pumps, will, of course, be done at local stations, and all that, of course, will again be screened at the pumping station.

Col. Ruffner: That is, you expect to do screening and sedimentation in each of those local stations, before you reach the pumping station, and there also?

Mr. Hering: Yes; the screening and sedimentation at the pumping station will, of course, be on account of the pumps.

Col. Knight: It has been determined at Hamburg—that question of sedimentation—that question has been practically put in use at Hamburg?

Mr. Hering: Yes, sir.

Col. Knight: Have you any idea as to the results?

Mr. Hering: Well, the results are very good, of course, they must dredge the rivers there; but, there is no complaint whatever that I could hear of that the sewage is silting up the channels there.

Col. Knight: But what do they remove? Do you know anything about the proportion removed by sedimentation?

Mr. Hering: I cannot remember. They have a very small settling basin there by screening all the large matter.

Col. Knight: That is all?

Mr. Hering: That is all I know. That is right at the screen. Right at the screen; the settling basin is only about as large as this room (about 80 by 20*) but the system is only for the City of Hamburg,—the plant is not very large. That is all. And they get out everything they think is necessary, and they are entirely satisfied with the results, and the shipping traffic which passes right over the discharge points makes no complaint, and seems to have cause for none.

Mr. Dean: Did I understand, Colonel Lockwood, that questions might be asked after the completed statements?

The Chairman: After each individual, yes.

Mr. Dean: I would like to ask some questions of Mr. Harrison, as to his statements, and of Mr. Hering, subsequently. I would like to go into the details of this project—

Mr. Lebkuecher: Mr. Chairman, might we not be first heard here? There are here a number of representatives from the Passaic Valley district, and we want to make a full expression of our case; many of them cannot remain here very long, and this questioning can come later, if you please.

61 The Chairman: I think that might be as well—what do you say, Mr. Dean?

Mr. Dean: It is entirely agreeable to me, provided the gentlemen whom I desire to question in order to obtain the details of this project can be detained to answer those questions subsequently?

The Chairman: Well, Mr. Lebkuecher, you can arrange that?

Mr. Lebkuecher: I understand Mr. Dean wishes to question Messrs. Harrison and Hering, and they will be here after the presentation of our case.

The Chairman: Well, then, you may proceed.

Mr. Dunn: I have been obliged to give this subject considerable attention, both as a property owner in the Passaic Valley, as a taxpayer in the Passaic Valley, and, as a lawyer, protecting our city of Paterson, as its counsel, from attacks which riparian owners below our city have found it necessary to make against the city in order to cause it to desist from further discharging the sewage into and polluting the waters of the Passaic River, and, in consequence of that, I have also had occasion to give considerable study to this subject in connection with the Passaic Valley Sewerage Commission, which was first organized in 1896 and, from that time down to the present time, I have been in close touch with all their investigations, and know the work that they have been engaged in.

Now, the principal point, it seems to me, in addition to what has been stated to your board by the engineers here, to which
62 attention should be called, is this: Why is it necessary that there should be an improvement of this kind in this Valley? and, who is it going to benefit?

Now, in the first place, I want to call your attention to the fact that in this Valley is represented one-third of the taxable ratables of the State of New Jersey. I want to call your attention to the fact, another important fact, that in this territory is represented one-third of the population of the whole State of New Jersey; and I want to call your attention to another fact,—that there is no piece of territory in the State of New Jersey to-day of such future, with such a promise, with such an outlook for development, that the Newark Bay, the property around Newark Bay and the Passaic Valley has if we can only get this relief for which we are now seeking consent from your Board. Now, the reason for that follows: The Passaic River is an open sewer, and it has been an open sewer, and, in consequence we must find some relief.

The City of Paterson, located as it is, at the upper end of this improvement, at the foot of the Great Falls, and the greater part of this City, its residential section and its factories, located along the River, as it winds through the City, is in such a situation to-day that we almost have to come to you appealing for help, for this reason: The character of our soil and the topography of our ground is such that there is no land South of our territory available, and we cannot
 63 go North because that is all up hill; there is no land lying South of our City as it lies, there is no land South at all available or suitable for sewage disposal work; there is no land that we own East of the Passaic River, and that is in Bergen County and in foreign territory.

We have been annoyed for a considerable time by these riparian owners whose property was being disturbed, whose land was made unsalable principally because of the pollution we were discharging from our factories and sewers into this River, and in 1901 they started suit for an injunction against the City; we resisted and defended ourselves against the suit,—the litigation was prolonged in consequence of this question, whether Paterson should be responsible to riparian owners for the damage done to their property or for only such proportion as was done by the discharge of the factory waste and pollution through her sewers, the fact being that along the river there are thirty-seven factories, dye houses, silk mills, locomotive shops and so forth, giving employment to ten thousand men and which discharge their sewage directly into the river; so that was the main question, the main question of discovery before the Courts in that litigation was as to the proportion of damage, and which has just resulted in a decree by Vice-Chancellor Stevens compelling us to pay a sum amounting in round numbers in damages and costs, to Thirty thousand dollars; in addition to that we have spent in the neighborhood of Twenty thousand dollars in protecting and defending ourselves; and that injunction is against us, to take effect
 64 by March 26th, 1911, that unless Paterson by that time makes an honest effort in finding a way to dispose of the sewage by March 26th, 1911, that injunction will issue, and unless the court of equity for good reason believe that such an honest effort has been made as in equitable terms may be so deemed, then and in that event the City of Paterson will be liable to the riparian owners in damages and compensation may be given and relief granted, so that we are now under mandate of the Court of Chancery to get that sewage out of these waters and cease polluting these waters by March 26th, 1911.

Now what else is our position The act of legislature which established the Passaic Valley Sewerage Commission, creating it, and which has come before your Board with an application for the best, and only system for purifying this water, under which this application is now made to your Board, that act provided that on December 12th, 1912, all persons polluting the Passaic River from Newark Bay up to the Great Falls should cease, and above the Great Falls the Passaic River or its tributaries, so that we have been informed by the Passaic Valley Sewerage Commission under that act that we

act within these provisions, so that even if the Court of Chancery should grant us an indulgence after March 26th, 1911, we would still be under the ban of that act, we would still be under the ban of both the courts and the sewerage commission, forcing us to get out of the river.

In addition to that, following along the banks of this river 65 is some of the most valuable and desirable property anywhere in the land is located, convenient for transportation, for factories, if we could do what the City of Passaic has been able to do for years, and we have not. Paterson has not been able to get new industries into the City because we have never had a place where their people and the factories could discharge their sewage their effluence without being liable to suits from lower riparian owners, so that the Passaic people have been able to get in more right along, and another important plant has just been located there, to cost a million and a half and to employ three thousand hands. But since Paterson has consented to unite with this Passaic Valley Sewerage Commission, what has happened to us? Right here, across River Street bridge, right at this point (indicating on map) there has been projected and is now being built a factory to give employment to five hundred men, the factory costing Four hundred thousand dollars, but this undertaking was located in our City with the precise understanding that we are to be able to get the consent of the Commission—the Passaic Valley Sewerage Commission that they be permitted to discharge their sewage—their effluence into the sewers.

I am speaking of this merely as an example illustrating the great future there will be for this district once we get a place where objectionable effluence can be discharged into this sewer without doing harm to the lower riparian owners. Now, why we should not have this future I cannot understand. There is Newark being permitted to develop all this territory in here (indicating on map).

66 Why, just take New York as it is now and as it has been in our time, and see how it has developed: You will remember the time here, fifteen years ago, you could readily buy practically all the land you wanted, the upland here (indicating on map) for a song, now the price of land of every kind has gone up so that you cannot buy it to-day, you can get a lease, or take more than you want to put into it, and coming down along Newark Bay here (indicating) you can hardly get dockage.

What is proposed here is to improve the great territory lying around Newark, available and suitable for such purposes. Here is Newark, with all her thousands of acres of land here (indicating) kept undeveloped. Why, I have been informed that at the Clark Thread Works, the stench from the river is such in warm weather that they have had to allow their employes to go home, although they have kept the windows closed on warm days. And at Passaic, in the filtration works, Mr. Gardiner, of the Water Company, has told me that the stench is such in the afternoons that they had to close down the works.

Now, then, we ask you if, in view of these facts, in view of the

fact that here is the city of Paterson obliged to pay Thirty thousand dollars in damages to those riparian owners because their property has been made unsalable, because sickness and ill-health has been produced in families and children, as testimony adduced there proved, because other people down along this shore are complaining of this nuisance, can it be said that this great benefit should be withheld from this great valley?

67 Now, then, another point that I think probably it would not be improper for me to make adversion to.

I understand that there are some people in the State of New York who entertain the opinion that they ought to object to this improvement—who have entertained the notion that this improvement ought to be objected to; just why, I do not know. We are neighbors and we should be neighborly, but there is an impression among certain men that they always ought to be appearing as objectors to any improvement going on.

Now, it seems to me that they ought not to take New York City, Brooklyn,—Greater New York as a pattern and come before this Board, representing the Federal Government, and make an objection to an improvement which means so much to the public health of all of our State, and which means so much to the industrial development of the territory there when they stand right here discharging raw sewage and street sewage right into the waters of the Bay.

But they say, "Oh, well, you ceded to the State of New York, the right to exercise dominion over the waters of this Bay and the waters of New York Harbor, and, therefore, New York people, and those who are responsible, are entering complaint, and you must come and consult them before you can build an improvement of that kind in the Bay". Now, in a word, to answer these objections, let me simply say this: I have given considerable study, careful study and investigation to those suggestions, and, in the first place, I say that

68 the position which the State of New York takes upon the question of nuisance is settled by the case of the State of Missouri against the State of Illinois in the case of the Chicago Drainage Canal. The Supreme Court of the United States has just rendered a decision and has said to the State of Missouri, "so long as you and your cities continue to pollute the waters of the Mississippi River, you do not stand in court with clean hands and until such time as you can prove that the evil of which you are complaining is produced alone by the Chicago Drainage Canal, you have no standing in equity."

Now, where does the State of New York stand, in equity, with clean, or dirty, hands, in making an application against New Jersey, for an injunction against the State of New Jersey, because it may happen to pollute the waters of the Bay, according to our engineers not in a lifetime, not in the lifetime of any of us and not in centuries with the present growth of population, will the Bay be incapable of taking care of the sewage from the population, as stated by Mr. Hering, and which all engineers have conceded is correct. So that, they will say to the State of New York that it is premature in trying

to have the Supreme Court of the United States imagine there is a nuisance there, of which they cannot adduce any proof.

The City of Newark applied for an injunction against the City of Passaic, in 1882; they wanted to build a sewer system in 1882, and the City of Newark was getting its water supply there and she very properly thought that when the City of Passaic, with sewerage from a population of thirty thousand, would render the water unfit by pollution. Now, what did she do? She went into the Court of Chancery and asked the court of chancery to grant an injunction, but the Court said, "no; that is not a principle of equity to enter an injunction in the case until such time as you prove the nuisance, until the injury is shown, we will hold off our hands and if, after such a time if it is found they are committing a nuisance there and do not abate it or modify it so that it ceases to be a nuisance, then the Court may act." So that the same principle invoked by the New Jersey court is applicable to the case here.

Just a word more: In saying that this great amount of money should be applied—the City of Paterson, in order not to be tied fast to any proposals of this very Commission and their very able engineers,—there was a feeling among our people that the cost of our apportionment of over Two million dollars was very heavy, considering that our total ratables at that time were fifty-eight thousand, although more now, being some ninety-two thousand,—that apportionment was made also seven years ago, and it was simply submitted to our people as a basis to work on, and the feeling was that every effort should be made to secure the very best results for the amount involved, and so we had Mr. Allen Hazen make a study and investigation of this whole subject and recommend to that City what was in his judgment, what was the most feasible, economical and practical and effective plan to adopt, and he recommended—he had studied the whole subject, both in this country and abroad, and he said that the plan which seemed to him as the one best plan was to erect a rock dam, across the river, in Dundee County and there install a sewage disposal plant, and he recommended that we immediately buy there five hundred acres of land and clear it up, right over the river here (indicating on map) South of this line, right in that (indicating) territory there which might be used for a disposal works. But there was no law in the State of New Jersey that permitted the City of Paterson or any other municipality to do this or allowed them to go out of their own territory and erect a disposal works. So, we went to the Legislature in the following Winter, and we presented to them the matter in full, including all of the recommendations, and the Legislature passed a law thus far: "We will grant to Paterson, or any municipality in New Jersey, permission to build a separate sewage disposal plant provided there be no objection on the part of the authorities in the territory in which the work is to be performed or from other persons having a right there at present."

We subsequently consulted with the authorities in Dundee County, and they said: "No, you cannot put up any out-house on our ground; we won't let you destroy a lot of land here",—and Mr. Hazen

says the smell, in his experience, would affect the value of land within a considerable radius of the disposal works, and so, as I say, we cannot build a separate disposal work on our own lands, and we cannot get land on which to build it, and so we said, let us go to

71 the Passaic Valley Sewerage Commission and say "We want to join you, join with you and our other sister municipalities here in trying to develop the resources of this territory and protecting the public health," and I submit to you, gentlemen that in view of the great benefit that is coming from it, in protecting the public health, developing property, improving the condition of such a large proportion of the population of the State and thereby increasing taxes and building up the commerce of the country, and in view of the evidence that navigation is not likely to be interfered with by the improvement, that you will not withhold your approval.

Mr. Lebkuecher: I understand fully that it is not necessary to explain to these gentlemen or this Board that a nuisance exists in the Passaic Valley—

The Chairman: It is within the personal knowledge of most of the members of the Board—

Mr. Lebkuecher: But I would like to have Mr. Eastwood, being the representative of one of the Boards of Trade along the River, tell you his views.

Mr. Eastwood: Mr. Chairman and Members of the Board, I am neither an engineer nor a lawyer, but a plain business man, a resident of the Township of Belleville on the banks of the Passaic River,—born and raised up there. I can remember when the Passaic River was one of the most beautiful streams in this country, perfect in every respect, its waters of the utmost purity, drunk by the citizens of Jersey City and Newark. Some years ago both of these large corporations were compelled to discontinue the use of

72 that water and secure a supply at other points at large expense. Since then, by the increased amount of sewerage deposited in the Passaic River, matters have come to a very terrific condition at the present time.

As a resident along that river, I am here to-day in the interest of this application before your Board. We have got to have relief in the Passaic Valley. We are now losing a certain amount of our population along the banks of this river. Our manufacturing interests are at a standstill, that is, as far as any increase in capital or enlargement of factories is concerned, for the simple reason that you cannot get any large project to locate on the river to-day owing to the condition of the atmosphere during the Summer. As one gentleman has very appropriately stated here, many of the factories have been compelled to close down their operations during the Summer when these extremely disagreeable conditions exist. No man who is in business can fail to appreciate what that means, and also that capital, when it is aware of such conditions, will not invest in or create any enterprises in such a locality.

Now, this matter of the Passaic Valley trunk sewer has been fought out for many years. I believe I am one of the first who adopted or advocated, rather, the trunk sewer. A number of years

have been lost to the people of Passaic Valley by securing proper legislation and by ascertaining the question so as to educate the people up to a point where such a thing is possible.

73 I must say that I, with great pleasure listened to the gentleman who spoke last; it was an eloquent moment to have Paterson come before this Board and advocate the adoption of this trunk sewer and the granting of the application to your Board to deposit this sewage in New York Bay; it is a great pleasure to every gentleman who has been interested in this project since its inception.

Now, in our little town, right above the City of Newark, North of that City, we are in a terrible condition. Not only has property depreciated in value, but it has had a tendency to drive people away from the River, for we cannot keep our property in proper condition. Anyone visiting that town will notice the condition of the houses there; there is not a house there to-day in respectable condition as far as paint is concerned; it makes no difference if you paint the houses three or four times a year, the gases arising from that river take the color out of the paint right away, so that every house there looks as though it had not had a touch of paint for twenty years. I merely state that to show the condition of the atmosphere. That is why we are here to-day, on behalf of the Board of Trade, of the first district of the Passaic Valley Sewerage Commission, asking for this application and for relief, and we think that under the circumstances, that while the City of New York and the City of Brooklyn are placing their sewerage in this Bay, that the State of New Jersey ought to have, if it does not, the same right in this Bay,—it should have an equal privilege,—if they are putting this incubus into the Bay in its raw state, we should have the right here applied for, as if it be not granted it will work the practical destruction of our community.

74 Mr. Sherrard: Mr. Chairman, and Members of the Board, I only want to speak of this question from the standpoint of the City of Newark; that city, as your Board knows, is already committed to the large scheme of a deep water harbor and dock improvements on Newark Bay, and we know that with the crowded conditions of the New York Harbor will bring this portion of the City of Newark very much to the front, and also all of Newark Bay, and it seems to us as we have looked at this project—I think the Chairman asked as to its location—the location is about four thousand feet to the South of where the tunnel and sewer pumping station is located on this map (indicating).

Now, the proposition of coarse screening and the provision for sedimentation, on this large project, would, in my judgment, relieve the Passaic River and Newark Bay of a good deal of the present deposit which has been a detriment to navigation, and on that one point alone, as has been shown by Mr. Harrison, this continual holding back of the flow of the river causing a deposit in the Bay, is a detriment to navigation, and the pumping out of this portion of the sludge in the sewer will to that extent be an improvement in the

condition of navigation in that vicinity—of Newark and of New York Harbor.

Mr. Lebkuecher: The Mayor of Paterson is here and will hand in a paper, which he would like to form a part of the record of this hearing.

75 Mr. McBride: Mr. Chairman, and Gentlemen: I do not propose to take up your time, but I would like to present this paper, for your record:

(Mr. McBride here presented the following paper):

"The City of Paterson, in the year 1868, began the construction of sewers discharging into the Passaic River. This action was taken under the authority of an act of the Legislature of the State of New Jersey entitled "An Act to Authorize the Construction of Sewers and Drains in the City of Paterson," approved February 26, 1868.

At that time, the only method of sewage disposal in use in this country was that adopted by this City, namely, the discharge of sewage into running water. Such action was taken in good faith, with the belief that this City had a legal right so to do, and that it was the best and only method whereby the public health and public interests could be subserved.

With the advance of time, of sanitary knowledge, and increase of population, it was found by the City of Paterson in consequence thereof, that such discharge of sewage into a river of the size of the Passaic, was inevitably the cause of a public nuisance. From this nuisance the City of Paterson, through its discharge of such sewage, has itself suffered more than any of its neighbors.

76 As long ago as the year 1894 the attention of this City was called to the then existing conditions of nuisance, by the local Board of Health. This City was then called upon to defend itself against the charge, that it was the chief cause of the pollution of the Passaic River. This the City denied, and denies now.

In our opinion, the chief sufferer from our own pollution is the City of Paterson itself, and not our neighbors below. We firmly believe that the Passaic River has sufficient volume and diluting capacity to care for the sewage of Paterson alone, without causing any public or sanitary nuisance to those situated below us.

Unfortunately, however, other communities possessing the same rights and privileges granted by the Legislature of the State, as we possessed, have utilized those rights and privileges, as we have, to empty their sewage into the river, until the bulk of sewage has become so great that the ordinary and natural flow of the river is insufficient to properly dilute and take care of such sewage. The result is, therefore, that to-day, and for the last 18 years, a public nuisance, by reason of such discharge of sewage, has existed in the valley of the Passaic River below the Great Falls.

Such nuisance, although in our opinion not affecting the public health, has unquestionably depreciated the value of property contiguous to the river, and has been a decided annoyance to persons living or employed in proximity to its banks.

77 The initial step taken by those realizing these conditions and suffering from them, was the attempt to pass a general act, in the year 1892, forbidding the discharge of sewage

into any river, stream, lake or pond. This, the City of Paterson, through its official representatives, strongly opposed, and as a means of preventing the passage of such an act, which would be most inimical to the interests of the City, proposed in lieu thereof, that inasmuch as practically all the communities bordering upon the Passaic River were equally guilty, that they should combine and unite their interests, and jointly act in such a way as to remove such nuisance and purify said river. Official representatives of this City, therefore, were responsible for the preparation, the passage and the signing of the bill, passed by the Legislature February 26, 1896, and signed by our respected fellow-townsmen, Governor Griggs.

Pursuant to this Act, Governor Griggs appointed, on April 21, 1896, as a commission, our late respected fellow-townsmen, Dr. Elias J. Marsh, and Dr. H. C. H. Herold and William T. Hunt, Esq., of Newark; a better selection than which, from any standpoint, could not possibly have been made.

This Commission reported, on February 26, 1897, said report, in brief, being that the interests of the various municipalities bordering on the Passaic River below the Great Falls, were identical, and that it was to the interest of each and every one of these municipalities to unite with the others in a manner, namely, a joint trunk sewer, to dispose of their sewage and prevent the existing nuisance by the discharge of said sewage into tidal waters.

This investigation has been continued up to April 1908. In the work have been engaged the most eminent engineers known to the profession in this country. The mere mention of their names is ample proof of the previous statement, namely:

Col. George E. Waring,
Alphonse Feeley,
Charles E. A. Jacobson,
Rudolph Hering,
James Owen,
Colin R. Wise,
Robert M. Watson,
William Ferguson,
J. J. R. Cross,
William M. Brown,
Gen. Henry M. Roberts, U. S. A.
Lieut. Col. C. W. Raymond, U. S. A.
G. S. Greene, Jr.
E. W. Harrison,
Wm. Barclay Parsons,
Allen N. Spooner,
George W. Fuller,
George A. Johnson,
Samuel M. Gray,
Allen Hazen.

79 The work of two of these gentlemen was done entirely in the interests of the City of Paterson; one, Mr. Gray, being engaged and paid by an organization of the citizens of Paterson,

desiring the good of the City; the other, Mr. Hazen, being engaged and paid by the City officially.

All of these engineers mentioned, who have studied the problem and become acquainted with the conditions and requirements in the Passaic Valley, have agreed—

(1) That a public nuisance existed.

(2) That such nuisance should be abated.

(3) That it was to the interests, economically and from a practical point of view, to each and every municipality bordering upon the Passaic River below the Great Falls, to unite and work jointly to accomplish the abatement of this nuisance.

The question presented to the City of Paterson is purely a business one. The law of March 18, 1907, forbids this City to discharge its sewage, unpurified, into the Passaic River, after December 12, 1912. By an agreement, made through its official representatives, with the Court of Chancery, since confirmed by an opinion of said Court, the City of Paterson has been ordered to cease such pollution on March 26, 1911.

The City is therefore bound in honor, in law, and by the mandates of the Court of Chancery, to cease polluting, by its sewage, the Passaic River, on March 26, 1911.

80 The proposition, therefore, before the City, was whether this result could best be accomplished by uniting with the other municipalities bordering on the Passaic River below the Great Falls, or by the building of a local sewage disposal system by the City itself.

As has already been stated, the eminent engineers who have given this matter their consideration and study, the universal opinion has been that the most economical and best way to accomplish the desired results was by union or by united efforts. All these engineers, except Mr. Gray and Mr. Hazen, have considered the interests of the District as a whole, and not the special interests of the City of Paterson. Mr. Gray and Mr. Hazen considered the interests of the City of Paterson alone, as distinct from those of the District, and reported on the advisability and the cost of local disposal systems.

Mr. Gray estimated the cost of a local disposal system for Paterson, at \$2,670,185, such system being for the disposal of 25 million gallons of sewage daily.

The report of the Passaic Valley Sewerage Commissioners, under date of April 20, 1908, gives a capacity for the carrying away of the sewage of Paterson to the amount of 63,952,300 gallons per day, at an estimated cost to Paterson of \$2,008,425.28.

Mr. Hazen (in whom this City has the greatest confidence, both as a man and as an engineer) was employed solely in the interests of this City, and gives an estimate of the cost of a sewage disposal plant at \$3,028,190. In his report he advises as follows:

81 "In view of all the facts and circumstances as I have found them, and upon the supposition that a full, just and lawful arrangement with the other municipalities upon the Passaic River is reached, acceptable to the Legislature and to the Governor, I

believe that the interest of Paterson will be best served by joining with other municipalities in the construction of a trunk sewer to take the sewage from the entire district requiring sewage disposal facilities in the Lower Passaic Valley to a point of adequate seawater dilution in New York or in Newark Bay near the Kill von Kull.

"I believe that this arrangement will be substantially better for Paterson than the separate local purification of her sewage."

Both the scientific and the economic side of this question have been most thoroughly studied, considered and approved by a Committee of the Taxpayers' Association of this City,—an Association without any motive except the preservation and advancement of the interests of the City, composed of citizens whose only incentive is civic pride and whose only object is the interests of the City in which they were born or lived.

Said Committee, after their investigation and study, reported as follows:

"We recommend that Paterson join with the City of Newark and other municipalities in an effort to secure the disposal of sewage by discharging it into the sea without treatment, other than screening."

82 The Special Committee appointed by me, the function of which was to advise the officials of Paterson upon the subject of the most economical, the most scientific and the best method for the disposition of the sewage of Paterson, after a most thorough and exhaustive study of the work already done, and after personal investigation of the subject sufficient to satisfy themselves of the justice and right of their conclusions, reported in part as follows:

"That we have fully investigated the subject of sewage disposal and are unable to find any system of local disposal that would be applicable to the City of Paterson, and that, owing to the date set by the Court of Chancery, namely, March 26th, 1911, limiting the time of our use of the river as a sewer, it is necessary that we take some action without further delay.

"Therefore we are of the opinion, that in order to comply with the order of the Court of Chancery and of the General Sewerage Act of 1907, pertaining to the discharge of the sewage of the Passaic Valley Sewerage District, limiting our period for the discharge of sewage into the river, that this City should enter into a contract with the other municipalities of the Passaic Valley Sewerage District, and with the Passaic Valley Sewerage Commissioners, with the understanding that the City may withdraw if the cost of the proposed trunk sewer exceeds the present estimate of \$12,200,000.00, paying our share for the securing of working plans, estimates and bids.

83 "We therefore recommend, that the Mayor and Board of Finance be authorized to sign such contract as proposed by the Passaic Valley Sewerage Commission, and that this City pay its share for the preparation of working plans and estimates

and the securing of bids, leaving, however, the ultimate question of the joining in the trunk sewer plan to future developments."

The Board of Finance, acting upon the above recommendation, resolved unanimously to enter into a contract with the Passaic Valley Sewerage Commission and the other municipalities interested, for joint action in the disposition of their sewage.

The City of Paterson is therefore of the opinion that its best interests can only be subserved by union with the other municipalities of the Passaic Valley and the joint discharge of their sewage into tidal waters.

At the present time, the sewage of Paterson is discharged above the Dundee Dam and above the tidal waters of the Passaic River. This sewage is carried down and is now discharged through the Lower Passaic River, Newark Bay and the Kill von Kull, into New York Bay.

The joint action of the various municipalities contemplated does not increase this discharge of sewage but simply provides for the collection of such sewage as will, under existing conditions, inevitably be so discharged, and its discharge at another point in New York Bay.

The interests of our City demand, in our opinion, a joint system of sewage disposal for the Passaic Valley."

Mr. Lebkuecher: Now, gentlemen, I do not think it is necessary for us to call any more, perhaps, of the people who are here at your invitation——

84 Col. Knight: There is one thing,—these gentlemen who have been called might be requested to remain until opportunity has been given for such questions as the opposition may wish to ask.

Mr. Lebkuecher: I will arrange for that,—I have already asked them to remain.

Mr. Heck, of the Jersey City Board of Trade, would like to address the Board in behalf of the application.

Mr. Heck: I only wish to say that, on behalf of the Board of Trade of Jersey City, and not only do I appear as a member of that Board, but as one of its Board of Directors, a few, a dozen or more, of whom are here,—that that Board has carefully considered the plans of the Passaic Valley Sewerage Commission and are in hearty accord with all that the Commission has determined and are supporting it fully; that we know the present conditions, that has all been said and that is about all to be said; we could only reiterate what has already been said. We think it is an improvement, that would affect Jersey City materially, as well as Newark Bay. A good portion of our City is bounded by Newark Bay,—the upper portion, by the Newark Bay and the Hackensack; it would also be an improvement to Jersey City flats and Bayonne Neck, and we think this matter of sedimentation and sewage in the Passaic Valley and Newark Bay ought to be done and as speedily as possible.

I am the representative, also, of owners of land in the lower portion of Jersey City, in the neighborhood of this project and now in

the way, will have to be applied to personally for privileges, and I can say, personally, as representing eighteen or twenty acres, that we will in no way interfere with the project but hail it, and we thoroughly advocate the adoption, or, at least, the consent of your Board to the privileges now sought for.

Mr. Payne: I am here, representing the Riparian Commission of the State of New Jersey, simply in answer to the invitation of this Board, and I have nothing to say in addition to what has been so ably said.

The Riparian Commission is intrusted with the improvement and sale of its riparian lands, and anything that would enhance or raise their value is, of course, in line with their duties, and they feel sure that the Commission in the direction of this important work, are attending to it properly, and I have nothing further to add.

Mr. Lebkuecher: I do not think it is necessary to call any more advocates after the presentation that has already been made; there is only one thing I would like to add, and that is,—when this project of discharging the Passaic Valley sewage into New York Bay was first brought forward by the engineers employed by the Passaic Valley Commissioners, we, as commissioners were uncertain as to whether that was the proper thing to do, and we were told by the engineers and assured that it would cause no pollution whatever.

The question also came up, advanced by other people in the State, and the Legislature passed an Act that we should first find out, and get the best information possible as to whether there would be any injury in New York Bay, by reason of this discharge, if discharged as proposed, after screening and sedimentation.

In pursuance of that Resolution of the Legislature, the Commissioners got the opinion of a number of experts from the Army Board, and we have here ((handing the Chairman a paper) our report, giving the opinion of General Henry M. Robert, Lieut. Col. C. W. Raymond, and C. S. Greene Jr., Civil Engineer, and I would like to submit it as accompanying our application.

If there are any questions to be asked, these gentlemen are ready to be interrogated.

Mr. Dean: The State Commissioner of Health, Dr. Porter is here, and says he will have to catch a train back to Albany—

The Chairman: Dr. Soper was going to address the Board—

Dr. Soper: Mr. Chairman, if you will hear those who are down on the programme when their names are called, they can make their remarks—the questions might come afterwards—otherwise a number of people here I know want to go out of town and it is impossible for them to come back, and they will not have an opportunity to be heard.

Mr. Dean: It is absolutely necessary for me to ask certain questions, to cross-examine, some of these witnesses for the reason that they have not given certain details it is necessary to have in order to understand the nature of their application entirely—

Mr. Riker: I do not think there should be a cross-examination of our witnesses; there is a litigation pending between the State of New York and the State of New Jersey, before the Su-

preme Court of the United States, and I understand that the gentleman who is on his feet represents the State of New York, and I do not think that the witnesses on behalf of the State of New Jersey, if he so terms them, should be subjected to a cross-examination, and I think nothing should be asked of those witnesses except what is actually germane to the subject-matter before this Commission. I do not think there should be a fishing excursion for evidence against the State of New Jersey.

Mr. Dean: Mr. Chairman, I am not on a fishing expedition; I want to find out what is going to become of this sewage. I wish to find out what the specifications of this Commission consist of? As the representative of the State of New York I believe we have the right to find out whether this sewage is going to interfere with the navigation of this harbor. It is true that the United States Government has the primary right over the navigable waters of this State, but the law is well-settled that the State of New York, or any State in which are navigable waters, has a secondary right, and that is what we wish to invoke, and it is for that purpose that I want to bring definitely to a head just what this screening chamber, this gravity chamber is to consist of,—what is the size of the dispersion area, and the size of the solid matter in suspension, and how
 88 it will affect navigation with reference to the largest of the big ships which enter this harbor, representing investments of millions of dollars, and, consequently, the commerce of this State and City.

The Chairman: You only want the engineers?

Mr. Dean: Yes, sir.

Dr. Soper: Every one of these men (referring to names on list) may go out before Mr. Dean, or one of your Board has put questions to the engineers with regard to this matter.

Mr. Miller: I have no especial status here, except as I represent the Department of Justice, and I did not wish to interrupt the presentation of the case by the proponents, in order to ask certain questions as to the bearing of the application with reference to that Department, and I am perfectly willing to wait and suit the convenience of this Board. I want to know, on behalf of the Department of Justice what effect this will have upon commerce and navigation, and, of course, that can be brought out by other methods. I do not want to ask any questions, and I therefore hope that the gentleman representing the State of New York will bring out such information as desired, of course, subject to the right of New Jersey to answer or not.

The Chairman: Mr. Miller, this Board has been deputed to hold this hearing, and they are men who have had experience in this sort of work for a good many years. I think the mind of the Board is pretty well made up as to what information they want. We want

the information covered by the endorsement of the Chief of
 89 Engineers in sending this matter to us. I do not like the idea of bringing in technical matters, if it can be avoided—

What is the sense of the Board? Shall we give Mr. Dean an opportunity to proceed to cross question the witnesses—

Col. Knight: I do not like the word cross question or cross-examine; I should prefer the word "question."

(The sense of the Board—after a moment's discussion.)

The Chairman: You may proceed, Mr. Dean, to question the speakers who have made their presentation.

Mr. Dean: I would really prefer to let the other speakers get through, and then ask such questions as I may—

The Chairman: Then that may be done.

Dr. Soper: Mr. Harrison has made the chief remarks of a technical nature, and described what was intended by the Passaic Valley Sewerage Commissioners.

I will not attempt to reply to many of the statements which he made, although I am very strongly tempted to do so. I am sure that some of the fallacies which have been fallen into and stated by Mr. Harrison, will appeal to others who will speak here before your Board—

Col. Knight: But, Dr. Soper, please do not give us anything by indirection: If you have anything to criticize or to comment upon in a person's statement, if he has made, in your opinion, an error, please refer to that error directly.

90 Dr. Soper: I would call attention, as one error, to the fact that the disposition of sewage in the New York Bay, and its effect, has been largely based upon the observed effects of the disposal of sewage into fresh water, and to state that the effects, particularly with regard to sedimentation of solid matters in salt water and in fresh water, are quite different.

I have an exhibit here to offer in that connection. Sewage sludge has been mixed with fresh water in one bottle and an equal quantity of sewage sludge with salt water in another; the bottles have been allowed to stand, in this case, one hour; the clearer bottle shows the effect in salt water, where the sewage sludge is deposited much more rapidly than in fresh (Referring to photograph of exhibits mentioned). In this case (referring to separate photograph) the exhibit shows the effect of three hours' standing.

Col. Knight: Have you any volumetric determination as to the amount of dispersion?

Dr. Soper: None has been reached.

Col. Knight: This is merely a question of experience?

Dr. Soper: A question of experience.

Attention is called also to the fact that the specific arrangement for screening and settling and discharging the sewage are not given in the report, and have not been given by any of the gentlemen who have spoken here this morning.

You are requested to form an opinion on the statement that the necessary works will be constructed. The Metropolitan
91 Sewerage Commission has requested of the Passaic Valley Commissioners information on this point and has been no more able to get it than your Board has this morning.

The rest of my remarks, for the sake of accuracy, and to economize time, will be read; and are:

"The Metropolitan Sewerage Commission is an official body

created by the State of New York to investigate and report on means for permanently protecting and improving the sanitary condition of the waters of New York harbor and vicinity. Its report is to be made by May, 1910 (Do you hear me, Mr. Harrison)?

The present hearing is not a suitable occasion for extended discussion of the sanitary aspects of the Passaic Valley sewer, but this commission desires to make a few remarks upon the possible injuries which may result to navigation if the Passaic Valley project is carried out.

Although possessing certain novel features, the Passaic Valley project is not altogether new. Nearly thirteen years ago legislation was secured in New Jersey looking to a general system of sewerage for the sanitary improvement of the Passaic Valley, and this project has been urged in some form ever since. For the last seven years, at least, it has been proposed to collect all the sewage of the Passaic Valley district and discharge it without purification into New York harbor. The question whether injury would be done to the harbor if the Passaic Valley sewer was allowed to discharge crude sewage into these waters has been the subject of several investigations. In 1903 the Passaic Valley Commission was required by the New Jersey legislature to investigate whether the proposed outfall was likely to cause a nuisance to persons or property within the State of New York. On that occasion favorable reports were secured from a number of prominent engineers and, with the advice of the Attorney General and Governor of New Jersey the project was allowed to proceed.

Earlier than this the Harbor Line Board made an inquiry as to whether the discharge of the sewage would injure navigation. At that time it was proposed to discharge the sewage of the Passaic Valley into Newark Bay at a point about twenty-two hundred feet above the bridge of the Central Railroad of New Jersey. The Board examined this project and made an adverse report upon it under date of May 28, 1897. The Board summarized its opinion in the following words: "It is easy to see that it will require only a few years to make the proposed sewer system not only a public nuisance but a serious obstruction to the navigable waters adjacent to the harbor of New York."

In 1903 the Legislature of the State of New York created the New York Bay Pollution Commission to investigate the threatened pollution of the waters of New York Bay and vicinity. One of the recommendations of the Pollution Commission is especially worthy of attention at this hearing. The Pollution Commission protested against the execution of the plan to discharge the crude sewage of the Passaic Valley into New York bay and advised the Governor of New York that in the event of the Passaic Valley Commissioners pressing the construction of their works, action be brought in the Supreme Court of the United States against the State of New Jersey and the Passaic Valley District Sewerage Commissioners.

So far as the proposed plan for diffusing the Passaic Valley sewage through the tidal waters can be comprehended, it gives inadequate assurance that the sewage will be immediately diffused and

dispersed. Diffusion and dispersion are phenomena which, as related to the discharge of sewage into harbor waters, are not sufficiently understood to be within the range of exact engineering control. Experience shows that the discharge of large volumes of sewage into a natural body of water generally produces evil consequences in the vicinity and that the extent of these evils increases more rapidly than the quantity of sewage.

The Passaic Valley scheme bears a certain resemblance to works which carry the sewage of Boston and its neighboring municipalities into Boston harbor, and it is understood that the experience of Boston has guided the Passaic Valley Commissioners in making their plans. Having visited Boston and seen the outfalls in that vicinity the Metropolitan Sewerage Commission has no hesitancy in expressing the opinion that the conditions in Boston harbor should not be duplicated in New York bay.

Freedom from evil effects cannot be urged on the ground that grit and large solid particles will be removed before the sewage is discharged. The amount of harm which might result would not be confined to the channels near the sewer outfall. In places

remote from the mouths of sewers the bottom of New York harbor is already covered with accumulations of fine black material which it has been impossible to distinguish from sewage sludge. The United States Government has removed thousands of cubic yards of this material from Ambrose Channel.

The evil results which would follow the deposit of sewage matters in the channels would not be restricted to the mere cost of dredging. The interference which vessels might experience from the presence of dredging machines should also be considered. In this connection it should be remembered that the proposed outfall works would be located in the land-locked part of the harbor on the edge of the main ship channel, and consequently in the direct path of vessels bound in and out of New York, Newark Bay, the Kill van Kull and close to the path of the Municipal ferry between Manhattan and Staten Islands.

The need of affording adequate sewerage facilities for the rapidly growing municipalities in the vicinity of New York City, and the importance of keeping the river tributaries clean are fully recognized by the Metropolitan Sewerage Commission. But the practice of sanitating inland municipalities at the expense of the harbor is unwise. There is a limit to the quantity of filth which these waters will tolerate and which the public will consent to have floating about. Investigation has shown that portions of the harbor already receive sewage in excess of their capacity to assimilate in a harmless and inoffensive manner. It is the opinion of the Metropolitan

Sewerage Commission that the discharge of sewage into these waters should be restricted to such municipalities and districts adjacent to the bay as cannot otherwise dispose of their sewage except at prohibitive cost.

The present project of the Passaic Valley Commissioners is not the only practicable way of handling the sewage of the Passaic Val-

ley. It is feasible to purify the sewage of the twenty or more municipalities concerned by public works constructed for that purpose. The cost of constructing and operating works to purify the sewage of the whole Passaic Valley would not be materially greater than the cost of constructing and operating the works under the plans proposed, with their grit chambers, screens, pumping station and large tunnel under Newark Bay, the Bayonne Peninsula and New York bay. If such purifying works were built a harmless and in-offensive effluent could be discharged into Newark bay in place of discharging the raw sewage as now proposed in a more or less putrefying condition into New York bay.

It is the opinion of the Metropolitan Sewerage Commission that the discharge of sewage in the manner and in the quantities proposed by the Passaic Valley Sewerage Commissioners would be detrimental to the interests of navigation and that this project should be opposed by all who desire to see New York harbor maintained in a clean and unobstructed condition.

Mr. Dean: Dr. Porter, the State Commissioner of Health—

96 Col. Knight: Before Dr. Porter speaks,—Mr. Soper, you spoke of some parts of New York bay being already polluted to the limit—have you those in mind?

Dr. Soper: I am speaking of Gowanus Canal and Newtown Creek.

Col. Knight: You would not consider those as exemplifying the general condition of affairs around New York Harbor?

Dr. Soper: The general condition, no.

Col. Knight: A special case?

Dr. Soper: Yes.

Col. Knight: And, in the case of Gowanus, do you notice any perceptible difference in the condition there as you go from the head of the Canal down to the mouth of it?

Dr. Soper: There is no very material difference until you get to the Bay.

Col. Knight: But you will admit that at the Bay the relative percentage of trouble—if I may so call it—is very materially reduced?

Dr. Soper: It is reduced, but it is difficult to say whether materially or not.

Col. Knight: But you are able to determine that?

Dr. Soper: Contrary to what has been said this morning, there are no standard sewerages.

Col. Knight: Then how are you going to pass on the question of pollution, if you have no standards?

97 Dr. Soper: To fix the sanitary standards of the harbor for all time, is too much to do, or what the tide will do or the water permit; it is not necessary to-day to call people outright falsifiers—

Col. Knight: We are not talking about calling people names. When you say there are no standards,—what do you propose, yourself, your Board, to be governed by; where does the limit of pollution rest? You say it has been reached in certain localities in New York Harbor, and then you say there is no standard?

Dr. Soper: To answer you directly, we will include the Passaic River as one case in which the sense of the public of its odor has established a standard.

Col. Knight: Then your standard is that of the nose?

Dr. Soper: Of the nose, and of the eyes, and of the public health and of other considerations—

Col. Knight: But nothing definite?

Dr. Soper: This Metropolitan Sewerage Commission that exists to-day and which I represent as one of its members, has for one of its undertakings to come as near establishing a standard—a sanitary standard for New York bay as is practical—

Col. Knight: But you do not admit that anything exists to-day as a standard?

Dr. Soper: Not that can be stated in mathematical terms; no.

Col. Knight: Well, that can be used, practically, for determining whether the discharge of this sewage will pollute the waters of New York Bay?

Dr. Soper: We believe that the condition of the waters in Boston Harbor could be instanced as a good criterion.

Col. Knight: How are you going to apply the conditions of Boston harbor, practically, to New York harbor?

Dr. Soper: Boston harbor—there is a project proposed here which seems likely to produce the same conditions as in Boston, or worse, and we object to those conditions; we think that that is a practical application.

Col. Knight: You think that by developing or appropriating the Boston methods, either or both, is going in the wrong direction?

Dr. Soper: We do.

Col. Knight: But you have no standard or standards to measure by, as to whether that is wrong or right?

Dr. Soper: Not as yet.

Dr. Porter: My main object in appearing before you this afternoon is to state to you what the policy of New York, so far as the State Department of Health is concerned, is, regarding the pollution of the streams and of the waters of our State.

I believe that the discharge of raw sewage into the waters of this, or any other, State indicates a defective civilization.

I believe that the progress of science has been such and the progress of our health experience has been such that we are no longer justified in polluting deliberately and with full knowledge of the consequences that may result, the waters of New York harbor or of any other harbor or of any other waters, where it is possible to purify this sewage before it is introduced into those waters, and I withhold permission whenever it is asked of the Department, and have taken steps to prevent or remove such conditions.

(Reading:) "In appearing here to-day in opposition to this Passaic Valley project, I wish to be clearly understood as in no way intending to oppose, nor obstruct, any great and needed sanitary measure. On the contrary, I am here to oppose only the execution of a project that may not carry with it the fullest assurance that the

benefits to be secured will be realized in a manner that will not give rise to objectionable conditions—whether from objectionable deposits, offensive odors and appearance, or injury to health.

In approaching then the question at issue—the pollution of the tidal waters of New York bay—I believe that it will be both wise and profitable to consider the question from the most general and comprehensive viewpoint; to consider the Metropolitan District as a whole, including the municipalities of both States; to weigh the question involved with respect to the needs of the entire district, before stating any conclusions or giving a decision in any particular case. The need of this comprehensive viewpoint and reservation of decision seems to be particularly emphasized at this time in view of the fact that we are now beginning to realize with greater force the extent and effect of present pollution upon the waters of the harbor. Furthermore, the study of this whole question, as you know, has been entrusted by the State of New York to an Investigating Board, which has been studying this problem for some time and which it is expected will, within a reasonably short time, report the necessary information that will enable not only your Board, but others entrusted with corresponding duties, to consider intelligently and act safely in regard to it.

To give a decision in advance of such knowledge would, in my opinion, certainly be a step in the wrong direction.

The importance of any evil consequences that might arise from the proposed discharge of sewage from the Passaic Valley District into New York Bay can hardly be over-estimated. They would affect not alone the people of New York City but the cities and communities along the New Jersey shore as well. They would involve not only the comfort, health and life of these communities, but would also affect vast industries such as commerce, shell fisheries and others. It is, in fact, because the questions involve the health, comfort and welfare of the citizens of this State that the State Department of Health is particularly interested, and wishes to appear here to appeal to you for cooperation in conserving its policy in preventing a further pollution of the waters of the State.

The policy of the Department during the present administration has, I believe, been so fully and repeatedly expressed that it is by this time fairly well understood throughout the State. Briefly expressed, this policy is in opposition to the further pollution of the waters of the State, whether inland or tidal, in all cases where such pollution may appreciably affect the purity of these waters. In accordance with it, the State Department of Health has during the past four years used every effort to remove existing pollution and restrict the discharge of additional sewage into our streams and tidal waters.

Owing to territorial jurisdiction in this matter, the plans for this project have not so far come before me, either officially or informally, and I am, therefore, not in a position to speak with any degree of authority as to the proposition as a whole or in detail. I am informed, however, that the plan of the Passaic Valley Sewerage Commission is to collect the sewage of about one and a half millions

inhabitants of New Jersey municipalities lying along the Passaic River in a large trunk sewer some twenty-six miles long, and to discharge it into Lower New York Bay in the vicinity of Robbins' Reef Light. As to what methods will be used to purify this vast amount of sewage, or as to the conditions under which it will be discharged at the outlet, or as to the effect of the discharge of this large volume of sewage, at the proposed single outlet, upon the waters of the harbor and the health and comfort of the people, are questions which are of vital importance, but about which the people of New York have not as yet received positive information or assurance.

Judging from the report of the advisory engineers, however, it would appear that they recommend, and we are accordingly led to believe that it is the intention of the New Jersey authorities to provide, only a partial purification of this large volume of sewage. According to these engineers, it is proposed to construct upon the Newark Meadows a grit or sedimentation chamber and provide mechanical screens for removal of the coarser or grosser solids, and to provide at the outlet near Robbins Reef some two miles from shore, and at edge of the main channel, a system of multiple outlets submerged some forty feet below the surface, distributed over what they term a dispersion area.

There would seem to be little doubt that this method of disposal, compared with the present method in vogue in New York, where sewage is discharged without settlement or screening at pier and bulkhead lines, near the surface of the water, is relatively superior, judged from the standpoint of methods. As to the absolute efficiency of the method, under the conditions which it is proposed to discharge this sewage, it is not so clear. One thing we are certain about, and that is the inadequacy of the present method of disposal at New York City, which is apparent to any careful observer who inspects the condition of sewage pollution along the shores of Manhattan, and for a considerable distance above and below the city. It is true that the proposed volume of sewage from the Passaic Valley trunk sewer may be small compared with present or future volume of sewage from Greater New York—perhaps only ten per cent.—but have we sufficient knowledge at this time to be assured that this volume of sewage discharged with only clarification within the limited dispersion area proposed will not become in any way objectionable?

Viewing this question broadly, and in the light of what we do know as to efficient methods of sewage disposal, we can state with little doubt that there are methods of disposal by purification which are not only more efficient, but probably no more costly, than the method of disposal such as that proposed for the Passaic Valley District. The experience and successful practice in both this country and abroad fully bear out this statement. And, if this be so, it would seem that such methods of purification might better have been adopted, or at least proposed, as an alternative proposition.

I believe, therefore, that in view of what I have said, that it is our duty, and I would urge it upon you, that you give the most careful consideration to this project, and judge it not only in the light of the more restricted question of the silting up of the harbor

but also in the light of the sanitary questions involved. I trust that in doing this you will bear in mind the policy of the State Department of Health in reference to the protection of the waters of the State from pollution, and the fact that in matters pertaining to stream pollution the trend of public opinion and views of sanitarians is towards higher standards of purity. Finally, I would urge in this matter, that you withhold your approval of this project until such full information is furnished by the New Jersey authorities as to the methods of purification they propose to adopt; and that

104 you withhold your approval unless you are assured that these methods will safely dispose of this sewage without danger of offense, or injury to health, or damage to the many and important interests which are at stake."

Col. Knight: Have you not any definite information to give about those more efficient methods? What would you advise?

Dr. Porter: The methods employed, for example, at Saratoga, New York, by sedimentation, by septic tanks, by rapid contact beds made of coke, in fact, a dozen methods.

Col. Knight: You certainly give credit to Mr. Hering of being familiar with those methods?

Dr. Porter: No doubt at all.

Col. Knight: Generally, you do not consider his recommendations as made seem in accordance with the results obtainable by those methods?

Dr. Porter: No, sir.

Col. Knight: You claim that those are more efficient than are the methods he recommends?

Dr. Porter: I do not know that he has recommended any method for purifying the sewage,—as I understand it, he does not believe that the purification of the sewage is necessary.—

Col. Knight: You would say that he recommends clarifying rather than purifying?

Dr. Porter: Yes, sir; he recommends clarifying, rather than purifying.

Dr. Darlington: Colonel Lockwood, and Gentlemen of the

105 Commission: One of the gentlemen who spoke in favor of the application, brought up a certain legal question; I did not know whether that would be brought up this morning or not, and all that I wish to say are two or three words. I presume that you are all familiar with the legal aspect of the jurisdiction over the waters of New York harbor, but at the same time I desire to call your attention to the fact that the laws have set down that the State of New York shall have and enjoy exclusive jurisdiction, as to quarantine, over all of the waters of the Bay of New York and Hudson river, and, still further, that the State of New York has also jurisdiction over the wharves and docks and shores and land and over the vessels and crews, and that vessels shall be stopped and quarantined, and laws in relation to passengers, and so on,—in other words, the law gives jurisdiction beyond the State of New York; that the State of New York and the City of New York has jurisdiction over the health of the harbor, and I recently received a decision

from the Treasury Department on that question relative to something along that line——

Mr. Riker: May I be allowed to interrupt for a moment? Does the Board propose to hear argument? We did not understand that this Board would hear legal argument——

The Chairman: We will leave that out——

Dr. Darlington: We will leave that out, but, let me say that, on account of having jurisdiction, the Department of Health of the City of New York would certainly exercise the jurisdiction
106 of the City of New York should they attempt to commence to build; it is not a case of waiting, as one gentlemen spoke of as being the practice in equity, until we could prove the existence of a nuisance——

Col. Knight: I do not understand that any permit from the War Department would prevent you from commencing to act——

Dr. Darlington: If I understand correctly, the Harbor Line Board was not created to give permission for encroachments upon the harbor, but to prevent encroachment——

The Chairman: The question of jurisdiction is not now before us; we would not pass upon the question of jurisdiction; this hearing is to ascertain and report concerning the matters set forth in the endorsement of the Chief of Engineers on the application——

Dr. Darlington: I simply wish to state, then, in regard to some of the arguments that have been raised,—I would like to say that this supervision, which is vested in the City of New York, over the waters of the harbor, would be exercised.

I would like to ask this question, which they might answer at some future time; as to who is to supervise this sedimentation and cleaning? Will they permit officials of the State of New York to supervise those operations? Can the officers of the City of New York do that it is properly done?

The Chairman: That is a fair question for you to settle with them.

Dr. Darlington: And, also, if it be true that the paint comes
107 off the houses along the line of the Passaic River, what are we to assume but that after it reaches the Bay it will do the same to the vessels——

Col. Knight: It certainly will, if it is in the same condition——

Dr. Darlington: It is not claimed that they intend to purify it, but still, as the arguments seem to be very thick, by the engineers, who have not been able to say or determine definitely anything about it,—as this seems to be largely an experiment, why do not they let the first sewer of this kind, as proposed by the State of New Jersey run down and empty opposite Long Branch, Asbury Park, or some of the other New Jersey resorts, and see whether, in front of their own lands, it does any damage or harm?

As a general proposition, sewage is unsanitary, and the pollution of water by sewage is unsanitary, and if it is intended to increase the pollution of the water in New York Harbor by means of this new sewage system from New Jersey towns, a heavy burden of proof rests upon the persons who propose this increase of pollution, to show that it will do no harm.

I desire to submit that the burden of proof does not rest upon the City of New York, but upon the State of New Jersey, and that if there is any question of doubt in the minds of this Board, any doubt whatsoever, they are not at liberty to simply pass judgment upon it, but that they must decide upon the side of safety. This is a general principle in all public health work.

The time has passed when it is necessary to show that
108 a condition produces pestilence in order to be a nuisance and require correction. The standards of hygiene and of public decency are continually becoming higher. What was permitted twenty years ago is not to be tolerated to-day, and what is tolerated to-day will, in all probability, not be permissible twenty years hence. The fact, therefore, even of noxious and disagreeable odors must be taken into consideration, under the laws of the State of New York. Nay, more, there is large flotsam in the water, and even to-day driftwood which is polluted by excrementitious material is being carried into the houses of tenements,—people pick up this fire-wood, covered with excrementitious matter and take it home. We believe we have traced many cases of typhoid fever to the condition of the flotsam in New York bay.

The Metropolitan Sewage Commission was created to formulate a policy of sewage disposal for the whole metropolitan district, and, in due course, that will be done. How can we ever create better conditions if we allow these things to come in here now, as proposed by this application? The Metropolitan Sewerage Commission has already registered its opinion against the Passaic Valley project, and has enunciated the principle that large volumes of raw sewage from municipalities not on the shores of the harbor should not be discharged into these waters. It has come to my knowledge that the Commission has knowledge of many facts bearing directly upon
109 the sanitary side of the question which at present they evidently do not feel at liberty to put forward: Therefore, I think it will be better to let this application wait until some of those questions are settled.

Not only must we think of the condition when these great works are first put into operation with six hundred thousand people contributing sewage, but what will occur, let us say, in 1940, (and we must also take into consideration the suspended material which comes from streets and roads of that kind, which, on account of the streets not being paved in those country districts, come under the New York City standard) and subsequently, when the waste of one million, six hundred thousand people would probably be flowing out at that point.

The persistence with which these people, who are interested, endeavor to carry out their project, means that the people of the State of New Jersey do not care whether the harbor of New York be clean or otherwise.

The one reason above all others, it seems to me, why New York to-day is a great commercial center, is because of its efficient quarantine. If it were not for that, we would not have the commerce we enjoy. Let any great plague or pestilential disease become epidemic

in the City of New York through laxity of its health officials or the quarantine and I ask you, what would become of the commerce here? Why is it that New Orleans, with its splendid geographical position at the mouth of a great river, over which freight may be carried at a minimum expense, is not the greatest commercial center? Simply because of its history in the past with its relation to yellow fever. That is why I am here to-day. We are very jealous of health and quarantine regulations as it affects our commerce, and unless it can be proven absolutely that no nuisance whatever will be created in any way, shape or manner, the burden of proof resting upon the people who endeavor to build this work, we do not believe that they should be at liberty to undertake the work, and that you gentlemen, and all others in authority, should take the safe position, and prevent it.

Col. Knight: When that sewer was proposed to be built above Newark, at Passaic, the court did not take that position?

Dr. Darlington: I do not know with regard to that case.

Col. Knight: There the court said that they could not bring a suit to prevent the nuisance, but you must prove the existence of a nuisance, which you are going to prevent.

Dr. Darlington: We prevent nuisances before they are created in this City; we prove that the conditions would create the nuisance, and prevent its creation.

Col. Roessler: You represent the Health Department of the City of New York?

Dr. Darlington: I do.

Col. Roessler: The gentleman who preceded you referred to a State law which aimed to prevent the pollution of all streams navigable and non-navigable; that applies, of course, to New York Harbor?

Dr. Darlington: Yes, sir.

Col. Roessler: It applies to Newtown Creek, that we all know to be polluted?

Dr. Darlington: Yes.

Col. Roessler: Has anything been done to abate the nuisance there, under that law?

Dr. Darlington: Yes; things have been investigated looking towards the abatement of conditions there, by the Department of Health of New York City; we will not permit slaughter houses to dump blood or refuse; we make them keep out. We are endeavoring to correct that condition, but we are waiting until we can have the report of the Metropolitan Sewerage Commission, which is to be rendered in 1910. We have corrected many of the evils, but we cannot correct them unless we can stop sewers of this kind from being allowed to enter the harbor. Daily we find cases where we can trace typhoid fever—as near as you can trace anything of that kind, to people bathing in the waters of the Bay, and we will not permit the baths to be located off pierhead sewers to-day,—the Department of Health stops those permits.

Col. Roessler: And has any plan been formulated, tentatively even, that will prevent those obnoxious sewers entering those streams

along North Bay? Has anything been done looking to having that effluent cared for or purified in some way before it enters into the harbor of New York?

Dr. Darlington: Not as yet.

Col. Roessler: Is it contemplated?

112 Dr. Darlington: Yes; it is contemplated.

Col. Roessler: Will you please state what is contemplated?

Dr. Darlington: That belongs to the Metropolitan Sewerage Commission.

Mr. Dean: I am familiar with the law on the subject and I will take it up later on.

Dr. Darlington: It is contemplated; I do not know what methods will be employed.

Col. Roessler: I do not know that that has any special bearing on the question before us, but inasmuch as the matter has come up I thought it seemed just as well to inquire concerning it.

Dr. Darlington: There is one other point raised by the applicants, that I wish to speak of. It was spoken of, about the City of Hamburg having cholera within it, and Altona although using the same water—of the river Elbe—into which the sewage of Hamburg was discharged, not having the cholera within its borders except cases where water had been drunk in Hamburg. Now the reason why cholera was in Hamburg was simply because it drank its own pollution; the reason why Altona did not have it was because their drinking water was filtered. Filtration takes out the bacteria. On the question of bacteria, we have been able to trace that water acts—operates chemically on suspended matter or bacteria in coming over a long distance, to a certain extent, and bacteria are by this action to an extent eliminated.—it takes a long distance. Now, the

113 Croton water shed is comparatively free from nuisances, the lakes and streams or most of them have been acquired, and the edges of the streams have been acquired, and sewers diverted, and everything, yet in the City of New York I can find the colon bacillus, right in the waters which have been thus safeguarded, in the City of New York.

Col. Knight: We are not proposing to use the waters of the Hudson river for drinking purposes; that is used for cleansing the streets and for fire purposes.

Dr. Darlington: But people put their hands into it, they wash their hands in it, and bathe in it; and it mingles with the dust in the streets, and we have, we believe traced cases of typhoid fever to this very source of flushing the streets with that water, and we think the streets and the City would be better off without it.

(The hour of 1.35 p. m. having arrived, the Chairman announced a recess until 2 p. m.)

(After recess—2.10 p. m.)

The Chairman: The gentlemen will come to order, please.

I want to say that it is the sense of the Board that it is not proper or necessary to hear anything in regard to the law features of this

situation, for the reason that the Secretary of War, if he should grant a permit, merely withdraws the objections of the War Department, but confers no legal rights: What we do want to hear is with regard to the matters affecting the question of navigation.

Mr. Higgins: Mr. Chairman and Gentlemen of the Board,
 114 I come here representing the Chamber of Commerce of the City of New York who, I think I can make the assertion without fear of contradiction, are a disinterested body of men in the City of New York—the most disinterested body of men in the City of New York, and I want to make this emphatic because I come here with the most intense spirit on the part of the Chamber, in opposition to this movement, and, therefore, I make the assertion in the first person and say to you that they feel it is necessary to raise these questions upon this application: and those gentlemen have no motive of their own to consider; they are trying to do exact justice to the world, and their sympathies are with you in every way; there is nothing you undergo or suffer in your community over there that is not regretted, but what we sympathize with you.

Now, gentlemen, there are certain important facts I must remind you of. The City of New York cannot preserve her commerce unless she preserves absolutely her condition of a perfectly safe port, a safe port for vessels to visit and for passengers to land to carry on their transactions in the City of New York. Now, it must be remembered that the commerce of the City of New York represents almost the great bulk of the foreign commerce of the United States, and you can see how very important a matter it is to all the citizens, not only to the citizens of the City of New York, but to the whole citizenship of the United States.

I represent both the Committee on Harbor, and the Com-
 115 mittee on Foreign Commerce. I am the Chairman of the Committee on Harbor and Shipping, and Mr. Shweppe, who is chairman of the Committee on Foreign Commerce, requested me to make my appearance in his behalf.

Now, there are certain features about the harbor of New York that I am very certain very few people know. I am one that does know. I am the President of the Board of Pilots, and from that Board I learn facts, and they have assured me that there is a strange natural phenomenon in this harbor; that there is a body of water, between about Yonkers and just southerly of Robbins Reef which simply oscillates backwards and forwards and never reaches the ocean. Now, that is a very strange fact, and they have studied it mathematically. One of them told me only yesterday that he had stood on the shore near Governors Island and had noticed a barrel go backwards and forwards in this current, down to near Sandy Hook and back, it returned eight times without losing sight of it—eight times—that shows the return of the barrel in the tide; it was a proof to him of the fact he had stated to me, which was that this body of water oscillates back and forth and never reaches the ocean, and it is therefore the source of the deposit in the harbor, what is true of the barrel is true in respect to anything the water contains, and it is therefore the source of the deposit which is

made in the harbor and that deposit to-day is apparent in many respects; it has compelled the Government to look for a channel through the Bay to provide for the vessels coming into New York harbor, and the Government located Ambrose Channel; Ambrose Channel was built at a great expense, and to-day Ambrose Channel is threatened by this operation of the tide, and when that tide comes back it drives this whole body of water up in the direction of the different piers and docks around Staten Island, a lot comes up into Newark Bay, and so this operation goes on.

Now, therefore, when you make your calculations to discharge this sewerage right at the point where this oscillation takes place, and calculate that it is going to produce a self-clearing operation by itself, I want to warn you that it is not possible.

Now, in regard to foreign commerce, you should all know that if there should be an epidemic break out and it should be traced to any location of a sewage outfall in that lower harbor, and this great discharge of sewerage should produce in the atmosphere pollution and sickness there, do you gentlemen know what the effect would be? It would be so disastrous on the commerce of New York that it would be a long time before we could get over it.

Therefore, the Chamber of Commerce is vitally opposed to increasing the deposit of sewage in New York harbor for any reason or from any source. We find that the Health Officers of the State have considered the condition of the harbor and it is now so perilous that they have established this Commission of which you heard from my friend, Dr. Soper, who is the Chairman of that Commission. And that Commission was appointed with a view to seeing whether New York herself could not reduce the deposit of the sewerage which she is compelled to put in these waters at the present time by reason of her position. Therefore, this is no trifling matter. It is a matter of the very greatest importance. And I saw that, in the first application which was made to you, they admit there, they offer, I think, if I remember correctly, they offer to pay for the cost of dredging which may be the result of the injection of this deposit into the harbor; that is an admission on their part that the deposit is going to take place from it, and I consider that it cannot be avoided, and the deposit will necessarily take place, and that deposit must spread itself more or less into the channel. This place of deposit is right at the head of one of the main channels that go in and out of the harbor and any deposit that takes place there will tend to encroach upon and deposit in our great new channel, Ambrose Channel, as it is called, which is an absolute necessity to accommodate these great large ships which come here and bring to us the remarkable and fruitful results in money and passengers and freight shipments.

And my object is to simply repeat to you that the Chamber of Commerce places the utmost confidence in your Commission; they feel that you are going to examine this matter carefully, conscientiously and with the full view of the future and of the facts; that what you are authorized to do is to object to any action which has

for its possibilities a deposit to injure the channel, or any other injurious effect upon the City and Harbor of New York.

118 We therefore look to you with great confidence, that you will examine every fact connected with it, and that in your report, if you will join us in the view that it is not to be granted, you will undoubtedly make such a report to the Secretary of War. Other than that, of course, it remains to be opened to examination from time to time.

One of the greatest difficulties with such an enterprise as this is this: These gentlemen indicate to you all their precautions by which they hope to do away with the evil effects of this pollution, and yet, when you have given them the permission to create the plant and to adopt the measures which they wish to do, there is no possible way you can get your remedy. What are you going to do if you find that it does not operate as they wish and deposits do take place and are reported upon. You cannot make them undo it and destroy this great thing which is going to cost a number of million dollars.

Now then, before you grant the request, if there is a possibility of its coming out or going that way, you are incurring a fearful risk for the City of New York, and, therefore, I must beg you most earnestly to examine that, and if you have any doubt, that doubt should be on the side of the contrary view of the whole subject,—it should be denied.

I approached this meeting with a positive conviction, after reading a history of the different processes adopted in Europe; that there the question had become so very disagreeable that in the City
119 of Milan,—a City, I think, of one hundred and fifty thousand inhabitants, the stench was so great from the river that the people could not walk on the wharves with any pleasure.

Then, the City of Berlin adopted a most wonderful process, and the City now makes money on its sewerage. The water is drained off; the solid matter is expunged from it, and then put through a process and formed or made into cakes, and sold as a great fertilizer, with the result that the City is to-day in receipt of a larger interest—or of interest on a larger amount, greater than the whole cost of the plant, although it was a very costly plant. The same thing is taking place in the cities of England and elsewhere, and I feel, gentlemen, if you will examine into the various details and note the different steps which have been taken in Europe, you will find that there is a great variety of measures that can be adopted from which I fully believe these gentlemen can get their relief in some other form.

Col. Knight: Mr. Higgins, a very strong part of your remarks, or one very strong feature of your remarks, is that question of trying to prove from the barrel theory that this sewage will not find its way to the sea, but will oscillate up and down the waters of New York harbor.

Mr. Higgins: Yes; permit me.—I did not cite the barrel instance except as a curious fact, a fact which was told me yesterday by one who had watched the fact.

Col. Knight: That was to show that if that barrel never gets out

to sea, if it oscillates right up and down in the tidal current,
120 you would never get any of the deposit into Ambrose
Channel?

Mr. Higgins: I beg your pardon; this was a surface test,—the deposit on the bottom could get into the channel in a variety of ways.

Col. Knight: When it comes to the deposit on the bottom, we find in a special report, that according to an analysis of the movement of the water in the harbor—

Mr. Higgins (interrupting): There is not one of them that can be relied on. I state emphatically what I know about the tides; what I have learned from my pilots, which is diametrically opposite to those analyses.

Col. Knight: I wish every argument of that sort could be so readily disposed of.

Mr. Conkling: If the Board please, I am the president of the Realty League of the City of New York, an association of property owners, chiefly in the Borough of Manhattan, for mutual protection, they meet periodically, and at the last meeting this thing comes before us. So, I appear as the trustee of several estates worth several million dollars.

This matter of the sewage is a very serious problem. I might call the attention of the Board to the City of Berlin, Germany, with a population of about two million, and the City of Birmingham, England, with a population of about five hundred thousand, or nearly as large as the population of this entire Passaic Valley. There, they have a large sewage farm, which solved this question very easily. Does the Board know about Tuxedo Park, in

121 Orange County? I suppose not. That is some thirty-five miles out; it is North of Paterson about twenty miles; there, the drainage of one hundred and ten cottages flows into a system of septic tanks, and screened, and treated and disposed of; the system has been in use there for twenty years, and there is no smell of any kind, not even the remotest character; I was there yesterday, and have been there in hot weather and cold weather, and there is never any smell at all from that sewage disposal plant. Then, there is the State Asylum, at Morris Plains, New York, about thirty miles from here; they have a sewage farm there about a half a mile from the hospital; Morris Plains has a population of two thousand at the present time; I was there a hot day some time ago and there was no smell from the sewage farm whatever, only a half mile off, on a hot day.

Instead of polluting our Bay here by this sewage, there is some other method of doing it. As a New York man I should not say what, but perhaps the Hackensack meadows would do for the location of the sewage disposal plant. I crossed them yesterday, and didn't see a house for several miles, and if they can have a sewage farm within half a mile of Morris Plains, there seems no reason why they could not have this kind of a plant there on the Meadows and no one would be bothered by any smell; they could have a purification, filtration, clarification or any other "ation" necessary and put the stuff in such shape that the water could be discharged into

the Hackensack or Newark Bay without any damage to the Harbor.

122 Mr. Harrison said, I think, at least one of the speakers, that it would be more expensive to have a sewage farm or sewage area than to build the proposed trunk sewer: Aye, gentlemen of the Board, there's the rub! More expensive! The four million people of Greater New York must not suffer for six hundred thousand in the Passaic Valley!

I regret my duty calls upon me to oppose this scheme; but it will not do! We cannot stand it! Our interests are too large here. This Association which I represent owns property in the Borough of Manhattan alone worth about Two hundred million dollars. That is a great interest to have in real estate, and we claim that our stores, our houses, our theatres would be damaged by this proposed sewer. If the Board might like, I will submit to you a written statement in regard to the matter. I thank you for your attention. I am ready to answer any questions on behalf of the property owners as to our interests, our warehouses, our stores, our wharves.

Mr. Monk: Mr. Chairman and Gentlemen: This is a subject, Mr. Chairman and Gentlemen, that I have studied and practiced for nearly fifty years in New York City. With almost sixty years of experience around this harbor, and, with no offense to the gentlemen who represent New Jersey here in this application, I do not think, Mr. Chairman and Gentlemen, if they knew the sewage conditions of this harbor they would make that application.

I represent to-day, gentlemen, the Taxpayers of the upper part of the City and from Kingsbridge to Ward's Island on the Harlem River, from Ward's Island to Sandy Hook and from 123 Yonkers to Staten Island take the Jersey Coast to Tappan Bay,—that forms the tide of the Hudson and on this tide flows the sewerage on the New York side of the Bay, on the New York side,—the New York shore. That forms the bank of sewage, of solid deposits on the New York side and New York City, and around the New York shore.

Take the average soundings in 1893 from the pier at the foot of 42nd Street North River to Pier 11 East River, on the 16th day of May, 1893,—the soundings on the heads of those piers was twenty-six foot of water, and on the seventh day of March of the following year the soundings were nineteen feet; two-thirds of that raise was caused by the sewerage from the bulkheads under the piers.

To give you another idea of the amount of sewage that is discharged, take the piers of the East River, with their box sewers, the plank they run on the brick work of the bulkhead,—those are supposed to convey the solid stuff and the soft sewage into the tide waters, but it does nothing of the kind. Those piers are vast piles of it that is not carried away, and they open the bulkheads and let it out.

I have been reading of the sewage being discharged in the tide water; it is discharged into the bulkhead, and, to give you some idea of the cost, the City paid in the year 1903, the sum of Seven hundred and thirteen thousand dollars to a few concerns in the City to

dredge the bulkheads to fourteen feet of water on the East River.

124 Now, gentlemen, take it around from Astoria, Long Island City, Greenpoint, Williamsburgh and Brooklyn, the hundreds of sewers, all the number of them, and the way they are discharging into this river, not taking account of what is discharged from the sewers on the New York side of the East River, and look at the condition of the water here at very low tide (referring to map). Go from there to Harlem, from Ward's Island to Kingsbridge, and it is really disgraceful to the City of New York to see the condition of that water.

I remember the time, gentlemen, when you could go in twelve feet of water and you could see the pebbles on the bottom of this river. You cannot do it to-day, and it is only possible by keeping a dredging machine going almost steadily over opposite Jersey City, to Robbins Reef, Spring, Summer and Fall, to keep a channel in so much water so that the vessels can get up to their piers. Those are the evils where the solids are discharged and it does not get beyond the pierhead.

Now, gentlemen, I would not advance this argument in opposition to the views of the gentlemen from Jersey only I know that other means can be adopted to discharge the sewage, and not South of the lower Bay, close to the tide water. As the gentleman remarked here that the sewerage can be discharged at a depth of forty feet, why not discharge it in a reservoir and pump forty feet of water up into the reservoir, by a stationary pump, and treat it there and
125 discharge it by land, over land, at ebb tide, and have the openings closed so that none of the discharge would go into the flood tide.

I intended to bring you, gentlemen, a design I had made, twenty years or more ago, for the purpose of conveying the sewerage of Jersey City to Gravesend Bay, and that sewer was to be able, according to the plans, to run parallel with the East and North rivers, forming a combination sewer here below the Battery, with no discharge along the shoreline until we got to Gravesend Bay. Now, gentlemen, that means for all time. It don't mean for the present. Look at what is coming. Go back fifty years, with a population of three hundred and fifty thousand in New York City, and see where we are to-day. You are granting this permission for all time, and we all know that that harbor is not in condition even to-day to receive the sewage that is going into it. I beg of you, gentlemen, in the interest of the City of New York of which I am here as representing a part of it, that that application will not be recognized by any intelligent body of men.

Col. Knight: Will you kindly give us a little more detail about that sewer that was to go down to Gravesend and be discharged at Gravesend Bay? I do not care about the construction of it, I mean about the discharge into Gravesend Bay?

Mr. Monk: I designed the sewer, I think, twenty years ago; I also designed a sewer to take the place of our present box sewer, but because of the conditions here as to political affairs—

26 Col. Knight: I would like to know about the discharge—the details of the discharge into Gravesend Bay?

Mr. Monk: Those sewers were to be run in a parallel line—

Col. Knight: Never mind,—coming down to the mouth of it—

Mr. Monk: In to a parallel sewer,—the nearest point of discharge would be Gravesend Bay—nothing along the shore line: The nearest point there is, of course,—you take Bay Ridge—

Col. Knight: As I understand it, you were going to carry out this parallel sewer to be formed into a combined sewer below the battery, and you were to carry out the sewage in this combination sewer, into a reservoir,—

Mr. Monk: And pump it out on the first of the ebb tide—

Col. Knight: Then you admit, from that, that the flood tide does no injury?

Mr. Monk: No, sir.

Col. Knight: How far will the flood tide carry this sewage?

Mr. Monk: From seven to nine miles.

Col. Knight: From seven to nine miles, that is the limit?

Mr. Monk: According to the way the wind blows there will sometimes be a difference amounting to a total of fourteen or fifteen miles.

Col. Knight: Never further than fourteen or fifteen miles under the most favorable circumstances?

27 Mr. Monk: Except when it gets into deeper water, beyond the action of the tide into the harbor. That is the object of most of these cities seeking to get their outfall beyond the tidal action.

Col. Knight: But did I understand then, that if all the effluent of this harbor were discharged at Gravesend Bay, it will not be carried back to the City, unless it be carried by the flood tide?

Mr. Monk: It will not be carried by the flood tide—

Col. Knight: You won't let it go out by the flood tide?

Mr. Monk: Yes, sir.

Col. Knight: The influence of the flood tide will only extend about seven miles unless there is a high wind and then double that distance at most, about fourteen?

Mr. Monk: Yes, sir.

Col. Knight: That would be the positive limit of any injury to the interests of the City by the tide carrying this sewage under those conditions?

Mr. Monk: So far as that is concerned, the tide, as it is in Boston—

Col. Knight: I am not talking about Boston, but here—

Mr. Monk: If you draw this (indicating) as the way the water in the sewerage, I presume you will get some of it over here (indicating). If a pump, a stationary pump be placed opposite this reservoir—this reservoir is forty feet in the air, lifted up forty feet, and the sewage is discharged about an hour before the ebb tide, it will go through and it will not come back.

Col. Knight: Then, there is no reason, with these control gates that they propose on this application here, why they should not make

the discharge then, at the first of the ebb tide, and remove all your objection to the use of the sewer?

Mr. Monk: My good man, they would not get far enough off if the discharge is made in the harbor. Now, then, as I remarked, I designed a sewer, in place of the present box sewers and as I have given this matter considerable study, and inasmuch as I thought it my duty as a citizen and taxpayer of the City to come here to give you my views on certain facts, and I know that I am speaking facts here to-day as to the condition of this City and of New York harbor. The position of that harbor is most disgraceful. The odor that arises from low water from the first of June to the first of October is horrible, and to a measure due to bad laws and bad legislation. If the waters of the upper East River had been safeguarded fifty years ago, it would to-day be fifty feet wider—one hundred feet wider, but then you could not get the riparian owners to put in the proper sewers, if they had done that, instead of putting in the bulkhead sewers, they would have done something for the City, they would not have

more water. And now, as you go through Little Hell Gate, and through the large gate and to the point about seven hundred feet beyond, where they are now building another large city, you will see what I refer to, and in thirty-five years from now the same will be true in Flushing Bay as you see here; and, again I ask you, gentlemen, as intelligent men, to study this question carefully before granting this application.

Mr. Colyer: Mr. H. R. Towne, President of the Merchants' Association, noted on your memorandum, has been unable to come and desires to have it understood that he would have been here under other circumstances.

Mr. Ring: Mr. Chairman and Members of the Board: I appear here as representing the New York Produce Exchange and I think I can also speak for other commercial bodies in the lower part of New York City. I think that the Produce Exchange has as large an interest in this matter as any other body of people in the City. We are located right at the lower end of New York, close to the water side; we have a large membership and a very large attendance; our offices are located in this section of the City and quite close to the point, or as near as any part of our City, to where this sewer is expected or intended to make its exit.

I come here, representing the Exchange, and enter our earnest protest against any permission being given to this sewer that is proposed by the Passaic company, simply because at the present time we empty our own sewage into the river is no reason why we should empty an additional quantity; on the contrary, as you have already been told to-day, measures are being taken or being considered whereby the sewage of New York City in course of time will be taken care of and will not be dumped into our bay and into our harbor. That time, I believe, is not very far in the future. It is a large subject. Of course, it is harder to remedy a thing than it is to make it right in the first place, but it will come.

Now, I wish to give you an illustration of what can be done with a sewerage farm, and that I know of by my personal knowledge.

has been stated here, I think, by one of the engineers, or at least one of the representatives of our New Jersey friends, that no system has as yet been discovered that will give perfect sewage sanitation and disposition. I take issue with him on that.

In 1889 I visited Australia and the City of Adelaide, a city of one hundred and fifty thousand inhabitants, had just incorporated a sewage farm. I was interested in it, naturally, and I visited the farm with some of the officials. It was located, as I recollect, about five miles outside of the City limits; a trunk line sewer conducted all of the sewage from the farm to this plant. The sewer, as it reached the plant, was taken up in large circular ditches and the water passed through certain sieves, that, I do not know what the substance was, but it took out all of the solid material; when I say all, I mean all absolutely, not a portion, and when it was taken out, that water came out just as clear as crystal, there was not a particle of sewage you could detect with the naked eye, and that water I saw, I looked at it and it was as clear as crystal, you could see it run through in the sewage ditches where it is taken out to irrigate the farms, and the water as I have said is as clear as crystal; no sewage in it. Now, as to the sanitation of it, how it is accomplished, I do not know, but by some chemical process or by the addition of some substance, it was rendered absolutely sanitary and the material that was taken out was put in shape for fertilizing purposes, and it was distributed all over the farm; and I wish to point out to you that inside of four years that farm was quite self-supporting and was a revenue producer; that was in 1889, and it has continued so ever since, and there has never been a complaint of any kind.

Now, as to Melbourne, when I was there they had an epidemic of typhoid fever; I visited the city a number of times but quickly got out of it, whenever possible. The Yara River was in a condition very similar at that time to what you say the Passaic River is now; it was crooked, dirty and smelt bad; it was a vile stream; the sewer was run into it and nobody wanted to be any nearer to it than anybody could possibly help. I arrived on a hot day, when to be near the river was almost over-powering. The epidemic of typhoid fever started the people to taking up the sewage system on lines the same as in Adelaide as might be necessary to be done. They bought property located within ten or fifteen miles of the City, and then Melbourne built a trunk sewer down to the farm, and inaugurated a similar system of sewage disposal to that at Adelaide, and only yesterday I talked with a gentleman from Melbourne, on this subject and he told me that the sewage farm was an absolute success; that it was a paying proposition; that it produced a revenue, that it purified the sewerage to such an extent that the water that came from it after it passed through this sewage process was absolutely clear and that it was not only clear but was so chemically pure that it could be drunk without any danger to any one, and that they sold the solid matter after treatment for fertilizer; which corresponded to what I saw when I was at the farm at Adelaide, and that same system, accordingly has been put in at Mel-

bourne and has worked admirably in both cities since. Now, I say that the United States or any city in these United States that cannot be up to modern ideas equal to those used away off in Australia is a pretty poor sort of a city, and, when the engineer or gentleman comes here and says that no system has been ascertained or devised that has proven satisfactory, I take issue with him directly.

I wish to speak to you on another point. I come here as a practical steamship man, and have been in that business for many years; I know that the sewage from this City does fill up our harbor. We have loaded steamers at various piers here, and we know that whenever we have to go near a pier where there is a sewer that empties into it, that place has got to be dredged out every three or four years, and the steamers frequently run aground, and we are unable to unload them in such piers because there is not a sufficient depth of water and this is true not only in the official piers, but
 133 privately owned piers, and we have dredged out many places for steamers to get out and not only that, but we have to wait for high water to get them to the piers. Take, for instance, along about Depew Street, Brooklyn, you cannot load steamers there drawing more than three or four feet, because of the large sewage deposits under which we labor at that pier.

I come here because of a double interest in this matter, and I do not think that simply because it is a matter of economy for the Passaic Valley boroughs, villages and cities, located in the Passaic Valley, that we should permit this imposition of emptying this sewage into our harbor when they can establish sewage plants there and can get rid of it. If the gentlemen think they can put the sewage into the condition they are going to and that in such a condition it will not cause a deposit or a nuisance, why not dump it into Newark Bay? We don't want it over here. If it is not a bad thing, let them keep it. We don't want it, and on behalf of the Produce Exchange of New York City, and I speak as a member of the Chamber of Commerce, I enter my strong protest against any permission being given to this scheme for sewage to enter into New York bay.

Captain Parsons: Somewhere about six years ago, the question of sewage was brought to the attention of our Maritime Association, of which I was at that time President, and we were informed then by the Metropolitan Sewerage Commission that, in twenty-five years,

with the continuation of the same conditions which had
 134 prevailed for the past few years that the harbor of New York would have reached the danger point for navigation from the sewage. One-quarter of that time has now passed, and we are that much nearer the danger-point, but we are nearer than that from the fact that the amount of sewage has increased in a greater proportion than previous to that time. I am here I suppose, to-day, to represent the sailing vessel interest more than any other one particular interest. I occupy a rather anomalous position, because I regret that I am here to oppose what New Jersey men feel as their interest, yet I am a New Jersey man myself, but I feel, Mr. Chairman, that no man, living along the Passaic Valley can divorce

himself from the best interest of the City of New York and of this harbor. The interests of the people living within fifty miles of this City are so closely allied with those who live here and do business here continually and are New Yorkers, that it is impossible to separate them, as no man can to-day in any way injure this harbor, if he is doing business in any way with the City of New York, without to some extent injuring himself. Therefore, I feel that the people who have charge of this sewage question would be unwise to make any arrangement incurring any extensive expense which would result in adding pollution to this already over-polluted harbor; but some method ought to be adopted, as has been suggested by the President of the Produce Exchange, my predecessor, to dispose of this sewage without injury to the harbor.

One of the gentlemen who has spoken since I came into
25 the room, said he had been familiar with this harbor for the last sixty years. I have a very distinct recollection that about sixty years ago the people dealing in fish in Washington Market were obliged to take their fish cars out of the slip from the fact that the water had become so polluted that the people who desired to eat fish in the market or buy fish from the market would not purchase them, feeling there was no assurance that while they might have come direct from sea, there was no assurance they had not come from those water-soaked, polluted fish cars, and consequently they were obliged to find some place for their cars where at least they were not in *sight* of their patrons; and this was sixty years ago.

One of the points which we object to, those who, of us, are interested in the affairs of New York harbor, is that it affects the navigable capacity of the harbor, and it obstructs it, as has been alluded to by my predecessor, by filling up the heads of the piers, shoaling the bays, which are used for anchorages for small craft or vessels where the channels are in the strong and rapid flow of the tide, if the tide flows across the channels, as is frequently the case, then they fill up very rapidly with this sewage. It is also a detriment to the navigable capacity of the harbor from the fact that these bays, little arms of the sea, as they may be called, rather more than rivers, show pollution to such an extent that it is injurious to the vessels and their

136 paint, both outside and inside, is so affected, that if a vessel painted white be remaining in some of those waters would have become lead-color in a day and if there two or three days, nearly black. This has prevailed to such an extent that the merchant owners will not consent to send their vessels anywhere along the Brooklyn shore during the Summer season, as it implies an entire new coat of paint, and it is not only the outside that it affects, but stains the inside. The other point is that it is absolutely unhealthy for crews of vessels to remain on board while located in the territories or localities where this has been so offensive, and this is continually increasing.

I feel, therefore, that we, of the sailing vessel interests, and while the foreign sailing vessel interest is rapidly disappearing, yet we do have a large coastwise sailing-vessel interest which is worthy of some

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attention and some respect, and that the merchants who are doing business by using those sailing vessels are also interested in that which pertains to their welfare, and I do most seriously and sincerely trust that some arrangement will be made whereby this vast amount of sewage, which it is proposed to be emptied into the Hudson river out of the Passaic sewer, can be provided for in some other way.

Mr. Riker: I trust that Mr. Dean will be confined to questions which are directly relevant to this issue,—that is, whether the proposed work will interfere with navigation. One of the questions between the State of New York and the State of New Jersey is
137 whether it will be a nuisance, and I do not want the witnesses we are to use in that suit cross-examined on anything but what is relevant to matters of navigation.

Mr. Lebkuuecher: If there is going to be some cross-examination, it seems to me that we might also with propriety ask the speakers on the other side in reference to some of their statements which they have made and which we think—

Col. Lockwood: I do not like the expression "cross-examination"; I think you had better "question" the witnesses or the speakers.

Mr. Lebkuuecher: We think that some of their speakers also made some statements which will not be borne out by the facts.

Mr. Dean: I am perfectly willing to have the gentlemen we called or will call questioned by the gentleman representing the Passaic Commissioners. We have special witnesses here who have not yet spoken,—one is the Consulting Engineer of the State Board of Health, and experts on sanitary matters, generally informed on this subject of disposal plants, and it is with these gentlemen we expect to take up the technical side of the case for you, if you wish to go into it. Of course, the other gentlemen who have spoken, have spoken as representing various interests.

The Chairman: I take it that this asking of questions is for the purpose of furnishing the Board with more information, and I will say that to that extent and for that purpose the questions may be limited.

138 Mr. Riker: We most respectfully object to any questions being directed to the gentlemen who have presented the case for the Passaic Valley Sewerage Commission by any person other than the Chairman or members of the Board: We have produced the most eminent gentlemen; the gentlemen will be witnesses for the State of New Jersey in the litigation now pending between the States of New York and New Jersey and should not be questioned on matters involved in that suit except in the litigation of it. These gentlemen will be glad to answer any questions which this Board may ask. This gentleman, who represents, as I understand, theoretically, the State of New York, is the same gentleman who drew the bill that has been filed in the United States Supreme Court, and for him to go over our witnesses and ask questions which this Board do not want to ask, I think is eminently unfair.

Mr. Dean: I have no desire to get any other expert testimony from Messrs. Hering or Harrison if they will bring out plans in detail. I want to find out if there are any more definitive plans, any

better defined plan with reference to their proposal as to sedimentation, and screening, in order that we may be able to learn exactly what proportion of the solid matter they propose to remove, and how. They have stated that there will be no deposit, and that they intend to discharge the sewage in a liquid form and that it will be readily dispersed. If they will furnish us with specifications showing their definite plans for the accomplishment of these results—

139 Col. Knight: I might say that there are no definite plans: there is no use questioning for definition of plans. You can see from their application just what the specifications are which we have before us.

Mr. Dean: That is what we are after. They have not furnished specifications, although we have been endeavoring to learn from them what they propose to do, we have not been able to get any information. We want to learn the proportion of the solid matter, and the matter in suspension they propose to remove, and how it is to be done. We want to find out the size of their sedimentation tanks, the size of the screen; and they have not, as I have said, furnished this information; therefore, I have desired to question them in order to ascertain just what their application is for, with a view to determining what the effect on the navigation of this harbor may be: what we want is something to go on.

Col. Knight: If you can throw any light on the sedimentation process, and upon the quantity of solids to be removed, we would be very glad to get the light, on the sedimentation, on the removal of the grit—

Mr. Dean: My first question is in reference to the grit chamber.

Mr. Harrison questioned by Mr. Dean:

Q. Will you explain in detail the size of the grit chamber, in your plans, as you propose to build the sewers?

140 A. The size of the grit chamber will be sufficient, in the opinion of the United States authorities to do the work or remove such an amount of grit as is necessary to prevent any obstruction to navigation, and we have so stated, sufficient to do the work, reserving to the United States government the determination of its sufficiency, and nothing done in the completion of our work will affect the navigation interests or the interests which the United States has, under the Constitution; and all will be done subject to the approval of the proper authorities of the port of New York; the plans will be submitted to them, as was stated in our application.

Q. As I understand it, the purpose of your petition before this present Board is to present your plans in detail, to show them how much solid matter will come out of the sewer, and go into the water?

A. You are very much mistaken as to what is the purport of our proposition; the object of our petition as is shown by the application,—we have proposed to put a structure in the soil of New Jersey, under the waters of New York and Newark bays and at certain points shafts, and so on; that structure will rest upon land of the state of New Jersey, and on land deeded by the State of New Jersey to the United States, in which New Jersey has the reversionary right—

Col. Ruffner: I object to this altogether. The Board likes to get information, but we are not here to settle points between one State and another. I think if the Board wishes to ask questions, if there are any doubtful questions, but if other gentlemen have doubts about it, this is not the place to settle them. I object. The Board
141 is not asking the questions.

Mr. Dean: May I present my side of the argument?

Col. Ruffner: You may make a statement of your own point of view, as much as you choose,—you can question, in your statement, the statements of other gentlemen, if you wish to, but I do not like to have you ask anybody else for further information.

The Chairman: Mr. Dean, will you please outline to the Board just exactly what it is you wish to accomplish by your questions?

Mr. Dean: I will say that the petition to this Board has been read, but I wish to draw attention to the fact that they request permission for the construction and permanent maintenance of tunnels under the navigable waters of Newark and New York bays, as shown by plans attached, before you. Then it goes on in five or six requests and asks permission to complete—to build a sewer.

Now, the amount of solid material that will come out of that sewer as effluent is very material for us to determine because if it is insignificant then New York can have no objection to the construction of that sewer, but if the solid matter is not properly removed in this screening chamber which they have described to us, that is if the size of the mesh of this screen be one-eighth of an inch mesh it will remove a certain percentage, and we ought to know this percentage, in order that we may be able to determine the result or the probable result of the screening they propose, as it has been determined in any of the different disposal plants where the sedimentation system is used; it has also been determined definitely what percentage of solid matter there is in ordinary
142 sewage. For instance, I would like to find out whether this sewer is going to—which is going to dispose of the sewage from these different municipalities, whether it will carry storm water, because storm water largely differs from ordinary sewage, in other words, there is not so much organic matter in sewage in what they call the combined system as there is in the separate system. Of course, in a separate system it takes away the storm water in one pipe and it takes away the sewage from houses and factories in another pipe, and I would like to know if they are going to use the combined or separate system, and as that determines largely the amount of solid matter in the sewage, then I say we can only determine the size of the solid matter, as it differs as explained under the combined or separate systems, by determining how much sediment is to be taken out in this grit chamber, and that, of course, consists of sand and broken up particles of soft organic and mineral matter, and then, when from certain storms they have, the sewage is permitted to run down at a certain rate of speed through the grit chamber, the tunnel is full, the question is, how much is going to be sedimented out, what certain proportion of the detritus can be settled out, and what certain proportion is going to escape? We would like to know how

much is going to be taken out in the settling basin, and by the screening.

The Chairman: Why do you want to know that?

143 Mr. Dean: My point is just this: I don't see how you gentlemen can pass upon such a plan as this unless you can say, or the experts can say, how much of the solid matter is to be withdrawn from this sewage, how much shoaling is going to be caused in the harbor, the amount of shoaling to be represented by that capacity, by the number of cubic yards of solid matter removed, the number of cubic yards of shoaling per year depends upon the amount of solid matter removed by screening in the screening chamber, in the grit chamber; the whole question, the most important point in this whole proposition, is to find out whether there will be shoaling; if there will be shoaling, then we earnestly contend that this permit should not be granted. If there is no shoaling the only question is whether these dispersion pipes, so called, will be placed at a sufficient depth in the water to permit of vessels passing by at low water.

The Chairman: According to the endorsement of the Chief of Engineers, the Board was directed to take up the question of having any deposited matter or shoaling removed by the people controlling the sewer——

Mr. Dean: Now, if it may please the Board, they have not shown what percentage they are going to remove of solid matters from this sewage——

Col. Knight: Why do you want to strengthen their case?

Mr. Dean: I want to find out——

Col. Knight: Don't you think the mere presentation of a
144 case without giving required details——

Mr. Dean: If they are willing to stand on the 1908 report of the Passaic Valley Sewerage Commission, then I am willing to say that——

Mr. Riker: Put that in your bill you have before the United States Supreme Court——

Mr. Dean: I wish to say that the suit which the State of New York has brought in the Supreme Court of the United States is in no way concerned in this hearing at all. He (referring to Mr. Riker) is now referring to that case. The legal questions will be taken up in that suit, but the reason for the opposing the granting of this petition at this hearing is for fear that your Board will grant a permit without having investigated every detail in this immense big subject, and which, if their permit was granted, would, to a certain extent jeopardize the case in the United States court, in which regard the Department of Justice is here represented by Mr. Miller, and to a larger extent where we are hoping within the next year to have further investigations made, and I might quote from different reports of different engineers, from one engineer especially, Mr. Allen Hazen, considered to be one of the best sanitary engineers in this country, where I believe he says that engineers are themselves *are* very doubtful as to what the effect will be in New York harbor, and it seems to me that the only way we can determine that properly

is to have the Department of the Interior make a complete and exhaustive study of the differences and conditions of the tides
145 in this harbor. I understand that the Metropolitan Sewerage Commission has done some work along those lines, but they have been limited to a certain extent in their investigations, and I think that this matter ought to be fully investigated.

We have had some general statements as to what the effects of the tides are. We learn, from the United States Government report of 1887, that there is an under-run, as stated from their own investigations—in the Government report—which goes up the Hudson river, but that was so many years ago that conditions might have changed, and we wish to investigate all points thoroughly. That is the reason why I wanted to bring these matters out fully. If you will permit me, I have sanitary experts here and I will be glad to have them make definite explanations of these matters for the purposes of this Board. We earnestly request that no permission be granted to these petitioners unless it is after a very exhaustive and full examination of this matter, and I do not believe, from my own stand-point,—the way I look at it, I do not consider that a full investigation can be made of the bearing of this application with what it involves, until these gentlemen can tell us how much solid matter they are going to remove, and that cannot be determined until they tell us the size of the screens, and how they propose to remove the detritus from the screening chamber, until they tell us the size of the grit chamber and how much solid matter such as sand and grit and mineral matter to the cubic yard they are going to get out.

146 They have failed to tell us anything at all—except by their silence—about the grease and soap that will work through the screen. They cannot hope to remove grease by their screens, and yet they say they are going to remove all of the floating material.

You know that in Boston harbor—and I am only making this statement in a general way,—we have experts here to prove it, if you wish to go into it—what the conditions are in this regard. We know that in the Summer time there are obnoxious odors which come off over the polluted area.

In the Government report of the investigation of the Boston sewage problem they state the exact existing conditions which have prevailed there at Boston, although they do not go into as much detail as we would if we went into this matter over here, but we do know that in Boston harbor the polluted area extends fully two and one half miles, and we know that these things exist, and we know that they cannot remove the grease through treatment by screening, and we do not know how they propose to do it. Now, if those conditions prevail at Boston where they have a tidal movement of fourteen feet—I am not positive as to this—in the polluted area, and with the tide movement in New York harbor of between four and six feet—I am not absolutely sure as to that point, and *the* it is an important point, I am going to ask Mr. Harrison these questions so as to bring out how much solid matter they are going to remove through their screens, what is the size of their grit chamber, and as to the effect of the sedimentation they propose?

147 (The following is read by direction of the Board) :

"NEW YORK, November 30th, 1908.

D. W. Lockwood, Col., Corps of Engineers, United States Harbor Line Board, Army Building, New York.

GENTLEMEN: I shall not be able to attend the public hearing set for the morning of December 9th, notice of which you have been kind enough to send me.

I would respectfully make the suggestion, however, that whatever restrictions upon the discharge of sewage into New York Harbor or its tributary waters may be finally determined upon, that they should be made equally applicable to communities in the State of New York and in the State of New Jersey. Any attempt at discrimination as regards privileges to be extended to each State can only result in delay and subsequent complications. The first requisite for a proper consideration of this subject is the certainty that the National Government so far as it is able to control the situation will treat each State fairly. If it shall appear that communities in New York State have already, acting in advance of New Jersey,—polluted the waters of the Harbor by the discharge of sewage then corrective measures should be sought for the facts as they exist.

I would respectfully submit that a sewage flow from the East into these waters is just as deleterious as a sewage flow from the West.

Yours truly,

(Signed)

CALVIN TOMKINS."

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"BOROUGH HALL, NEW BRIGHTON,
NEW YORK CITY, December 1, 1908.

Col. D. W. Lockwood, Corps of Engineers, Chairman Harbor Line Board, Army Building, New York.

SIR: The writer has been asked by the Staten Island Chamber of Commerce to be one of its representatives at the public hearing which you are to conduct on the morning of Wednesday, December 9th, in connection with an application of the Passaic Valley Sewerage Commission of New Jersey, for government consent to its constructing and maintaining a proposed great trunk sewer outlet in New York Harbor. He regrets that a prior engagement in Boston will prevent personal attendance, but instead will present the following notes.

During the three years of its existence, the writer was a member and officer of the New York York Bay Pollution Commission, the first official body to take up the question now before your honorable Board, and as Consulting Engineer and Commissioner of Public Works of the Borough of Richmond for the past seven years, has had under observation more or less constantly the conditions of the Harbor as to sewage pollution. In the design and construction of sewers for this portion of New York City under the President of the Borough, the question has been kept to the front and designs have been such as to provide for the future interception of sanitary sewage and the first discharge of storm flows, so that they may be treated and the effluent rendered inoffensive, in-occuous and non-putrefactive.

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Properly providing for the sewage of New York City and neighboring municipalities in both New York and New Jersey, is one of the great problems of the day. Much has been said about the shell fishery industry as a factor in the question at issue, and it is important; but aside from that, the comfort and it might be said the sentimental wishes of the inhabitants of New York and vicinity are of tremendous import.

The Harbor of New York and its tributary streams should be kept free from all refuse; floating, suspended or in solution. No community should be permitted to continue to an indefinite future the disposition therein of the solids of sewage wastes. Probably at the present time there is an average of twelve hundred to fifteen hundred tons of deposit daily. Some of it changes by putrefaction into gaseous form and passes off into the water or air, but the greater bulk of it remains as a filthy deposit on the bed of the Harbor, a little perhaps passing out to sea.

The large flow of fresh water coming down the rivers and the tidal inflow of more or less clear sea water, makes conditions safer than in some other of the great sea port cities of the world; but even New York and vicinity cannot long continue to abuse these advantages and not suffer seriously in consequence.

Now, to the point of immediate consideration, the application of the New Jersey Commission to your practically untreated sewage in large quantities into New York Bay at a specific point or several neighboring points. It may not be strict justice for New York City to continue to do itself what it wishes to forbid a neighbor from doing, but it is easily within the possibility of the New Jersey project to so care for and treat the sewage gathered from a number of localities, that the effluent, which could then be admitted to New York Harbor, shall be inoffensive in-odorous and nonputrescible, or practically so. We do not consider that it will ever be necessary for New York or the whole Metropolitan district to so treat its sewage as to make the effluent pure, but with the results accomplished as suggested, and readily possible, diffusion, marine organisms and chemical action of the sea water will effectually care for all that remains, so that the harbor will be kept pure and clean.

We therefore would protest against any consent being granted to the Passaic Valley Sewerage Commission, that is not coupled with the absolute provision that such sewage as may be permitted to enter the harbor shall meet the foregoing requirements.

Yours respectfully,

LOUIS L. TRIBUS."

Mr. Harrison questioned by Mr Dean:

Q. Mr. Harrison, I refer you to the special report of the Passaic Valley Sewerage Commissioners to the Governor of the State of New Jersey submitted June 8th 1903 and on page 13 read you the following which appears over your signature: "Experiment and
151 experience have shown that in the sewage of Eastern American cities these one hundred gallons per head will contain about one-one-thousandth part of organic matter and about the same

of inorganic or mineral matter, or about a little less than one pound of organic matter to each person per day."

A. That is according to Rathbone's measure, also the Royal English Society; it is less than George W. Fuller's investigation made in the last few years, but according to Roesder & Becker, on Sewage, that is about right; it is also in the investigation of the Massachusetts State Board of Health—that was about their figure.

Q. In other words, there is two parts per thousand of solid organic matter—

A. No, one part of organic and one part of mineral.

Q. Making two parts of solid matter altogether?

A. Two parts per thousand per person.

Q. Do you *subscribe* (agree) with Mr. Hering in a statement he made this morning that the sewage would consist of one part in five thousand?

Q. I did not hear Mr. Hering make the statement; besides, the sewage of Paterson is heavier than that; Orange is also heavier than that, I think that what he said must have been that it was no heavier than the average eastern American standard.

Q. I understood him to say that the sewage which would enter the grit chamber would have solid content of *one* (five) part in one thousand?

152 A. That may be his judgment.

Q. Engineers are not agreed on that?

A. Neither are lawyers; it is a question technical.

Q. What will be the amount of sewage, in gallons, which will be the ultimate capacity of the sewer?

A. The ultimate capacity of the sewer—

Mr. Riker: Does the Board want to go into that matter, it has been covered by the direct statement?

Col. Knight: That matter has been covered by direct statement this morning.

Mr. Dean: The reason I am asking the question is that I did not consider the statement they made this morning corresponded with the statement they made in their report. Their report says that the trunk sewer will have an ultimate maximum capacity of three hundred and sixty-five million gallons per day, and that the average daily sewage would be three-fourths of that amount; this morning they stated that it would be two-thirds of this amount, and if they are going to try and build—

Mr. Harrison (interrupting): Let me answer that question in regard to Mr. Hering. Mr. Hering gave you the amount of solids in the water which come right through the sewer; I have given you the average American sewerage, of one hundred gallons per head per day, that it would be made up of one part in one thousand of organic and one part in one thousand of mineral solids. The water that will go through this sewer will be two hundred gallons per head and sometimes three hundred gallons per head.

153 Mr. Dean: As I recollect it, the basis of calculation stated in your 1908 report was one hundred gallons per head—

Mr. Harrison: No; you are not correct. The house sewage was stated at 150 gallons per head, ground water leakage of the Passaic River, one hundred thousand gallons per square mile, East, and seven hundred thousand gallons per square mile; trade waste not exceeding ten per cent of the amount at the lowest. What the trade waste will be in 1940 is properly a calculation of averages.

Mr. Dean: Gentlemen, I can see we are going to have great difficulty in getting the information we require; will you please try and establish by the witness any definite statement given as to this plant?

Col. Knight: That is all before this Board; now, then, you differ with him on the question of the solid content; regarding these averages, and so on. Now, then, you have his statement, and you have the statement of Mr. Hering. If you have anything to gainsay it, why not bring it out by evidence? We are informed of that—

Mr. Dean: If they do not agree in certain material respects possibly we could make them agree by showing some other—

Col. Knight: I do not think this Board would care to have a forced agreement. We have these two statements giving the maximum and minimum of the solid material they can get out of the sewage and

154 that will go into the water; if these things are wrong, why not establish it by witnesses and give the Board the truth in the case, give the Board the true figures, bring out the facts of these proportions of solid matter. It may well be, as you can readily see, that if that proportion should be so small that distributed over an indefinite area it will not make a deposit of an inch in years, there is no interference with navigation, so that, how much you are going to remove is getting the cart before the horse, if there is not enough there to effect navigation, whether you remove one-tenth or one-quarter of it is immaterial.

Mr. Dean: Well, then, Mr. Harrison, do I understand that the statement you made about the average sewage of the average American citizen is applied to the sewage as it will come down this trunk sewer?

Mr. Harrison: It probably will; that is the statement which is accepted by engineers throughout the country and is about right; two parts to one thousand, the normal constituents of American sewage.

Mr. Dean: Then I do not understand your answer to the question about the average number of gallons ultimate capacity.

Mr. Harrison: The average ultimate capacity we assumed would be for a population of one million five hundred thousand estimated to be reached in about 1940. We cannot keep out of that sewer a certain amount of the ground water, and we estimate that the ground waters are to come in and will practically add eighty per cent to that one hundred gallons a day for the population of one million

155 five hundred thousand, their sewage, eighty per cent of the ground waters that we cannot keep out, perhaps some factory waste and that will make an ultimate average capacity for the sewer of two hundred and fifty million gallons for which we provide a sewer which will carry about three hundred and sixty million gallons because from four o'clock in the afternoon—in the morning, until four o'clock in the night perhaps, the sewer will run

at maximum which will be double the minimum at four o'clock in the morning but the sewer has got to be big enough to carry the maximum, the peak of the flow.

Mr. Dean: Do I understand that the Commission has not adopted any definite plans as to the grit and screening chamber?

Col. Knight: I do not think the questions are material. It is not necessary to go into that; whether they have adopted those plans or not, we do not care; that is already before this Board.

Mr. Dean: Mr. Harrison, has this commission investigated fully all of the alternatives which may be adopted?

Col. Knight: I object. It is not the question before the Board, how many alternative they may have studied; the question is whether the permit be granted to this Commission for this sewer as affecting navigation.

Mr. Dean: Will you tell us, Mr. Harrison, the depth of the height of the sewer of the top of the sewer below New York Bay where you propose to erect the shafthouse?

Mr. Harrison: At Riddens Reef?

136 Mr. Dean: Yes.

Mr. Harrison: Below New York Bay?

Col. Knight: We have got the profile of this proposed shaft-house; that is on record here; that is established by the application.

Mr. Harrison: The statement made in our application is that the bottom of the shaft will be forty feet below high water reserving the right to go lower.

Mr. Dean: Mr. Harrison, the plan you have submitted, is that the final plan for the construction of the sewer under New York Bay?

Mr. Harrison: I guess not; we will probably spend one hundred thousand dollars or so before we get the plan final.

Mr. Dean: Then you would not state that the sewer will be so many feet below high water, or will be so many feet below mean low water?

Mr. Harrison: Yes; we have; it will be at least fifty feet; maybe sixty or seventy—the State of New York is not interested in that; it will be in the lands of the State of New Jersey—

Col. Knight: He has given a minimum there, reserving the right for a maximum. There are two conditions there—

Mr. Harrison: Those conditions are apparent on a rainy day—those are only minimum conditions; there will be a maximum of that.

157 Mr. Dean: Coming back to the storm water, just how much of the storm water is to be taken through this sewer?

Mr. Harrison: In general, part of this Passaic Valley Sewerage District territory now has a separate system and another part has a double system; it is the purpose that the whole territory shall be equipped with a separate system; the only proportion of storm water we will get into the sewer when it is first completed will be the first rush of storm water; then it is proposed to cut this off by automatic pipes and put it into the river, and when we shall have reached that point in the working of this sewer, the community shall put in a separate system very soon; the law provides that the

apportionment for maintenance is to be based upon the proportions of water delivered from each of the communities, so that it will be to the interest of every community to put in a separate system and keep the amount of the sewage down, because otherwise the smaller communities would have to put as much where they have the double system or combined system as the larger cities would, having the separate system——

Mr. Riker: Does the Board feel that this is a matter for them to consider?

Col. Knight: The Board is allowing that answer to go on the record——

Mr. Riker: I thought that I would have an opportunity to object——

Col. Knight: The Board is merely trying to get information. The Board has its object. The Board, I think, will stop whenever they think it improper, as I think it has shown a disposition to do.

Mr. Dean: I really wanted to bring out the amount of solid contents which goes into the sewer from the storm water. From the statements which have been made it is impossible to ascertain just how much solid matter there will be in the sewage as proposed to be discharged. I have here Professor Landreth and Dr. Jackson, who tomorrow morning will make a statement here and also give testimony especially with reference to the effect of the sewage on the harbor of Boston, which is particularly relevant because of the expressed purpose of the Commission to adopt in a modified, and improved, form, the system there used.

Col. Knight: You will be prepared to show that the sewage in Boston harbor is treated substantially as they propose to treat it by this plan? In other words, if you are not so prepared to do, your statement as to Boston Harbor won't have any bearing——

Mr. Dean: That comes right back to the capacity of the grit and screen chamber; the only thing I can do is to suppose there is a similar or equivalent treatment——

Col. Knight: You will be prepared, when you make the comparison,—you will be prepared to explain the Boston method in detail?

Mr. Dean: Yes, sir.

The Chairman: It is now a quarter of four, and the Board will stand adjourned until ten o'clock tomorrow morning, December 10th, when it will hear anything further that may have to be offered on this subject.

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Second Day.

December 10th, 1908—10 a. m.

The Chairman: Gentlemen, if you will come to order, the meeting will open.

A letter was received this morning by the Board: I will read this letter as it came to the Board:

"NEW YORK, December 9, 1908.

New York Harbor Line Board, 39 Whitehall Street, City.

GENTLEMEN: Having attended this morning at the hearing on the subject of the Passaic Valley Sewer, and understanding that you will not be able to hear arguments from individual associations, we respectfully ask you to note our appearance on behalf of the Sea Gate Association and of the Atlantic Yacht Club, both at Norton's hint, in opposition to the plan of constructing a sewer, as described this morning by the engineers of the Commission.

From our observation of the water, especially in Gravesend Bay, we are convinced that, if any change is made in the handling of sewage, it should be a radical one, and on the lines described by the Commission's own engineers this morning, as existing in Berlin and Paris. We are of the opinion that, if Newark wishes to change its method of disposing of its sewage, absolutely no sewage from that city and the adjoining cities should be in any manner discharged into New York Bay.

We are yours very respectfully,

BARTOW S. WEEKS,

*Attorney at Law, Representing the Atlantic
Yacht Club, 2 Rector Street, N. Y. City.*

GHERARDI DAVIS,

*Attorney at Law, Representing the Sea Gate
Association, 44 Pine Street, N. Y. City."*

The Chairman: The first part of this letter was evidently injured by a mis-understanding of the situation. I do not recall that anything occurred yesterday that indicated a desire on the part of the Board not to hear any one who had anything to offer on the subject. The gentlemen were communicated with by telephone this morning and the mis-understanding is corrected. They were convinced that they were wrong in the statement they make in the commencement of the letter; they also requested that the letter be read and form a part of the record, which will be done.

The next letter is dated:

"WASHINGTON, D. C., Dec. 8, 1908.

Captain Parsons, 6 Coenties Slip, N. Y.

DEAR CAPTAIN PARSONS: I regret it will be impossible for me to be in New York at Harbor hearing tomorrow. I have written Mr. E. C. Hunter (Sec. N. Y. Dry Dock Ass'n) 30 Church Street, Tel. 678 Courtlandt, to consult with you.

Unless dumping of sewage into New York harbor is restricted the harbor will ultimately be on a large scale what Gowanus Canal and bay are now in a smaller way, an insult to decency and a bar to sanitary and business progress. The City is expending over a million dollars installing and hereafter will spend annually a large sum maintaining and operating a plant to clean Gowanus Canal and Bay. If New York harbor is allowed to get into similar condition I doubt whether tens of millions would

cure the evil. It will be infinitely better and cheaper to prevent than cure it.

Our Company, the "Yebo Yacht Basin Co." have a large and valuable water front plant at foot of 23d Street Brooklyn, during the past ten years the income therefrom has decreased one half as a result of dumping in and pollution of Gowanus Canal. The sewer refuse settles on the bottom and a gas arises that destroys painted surfaces so rapidly that in hot weather yachts cannot stop an hour in the neighborhood without danger to their decorations and men cannot sleep on board vessels without danger to their health.

The condition at Gowanus has retarded business development for years and caused enormous loss to the property owners in the neighborhood.

Yours truly,

WALLACE DOWNEY."

The Chairman: The following has also been submitted:

"NEW YORK CITY, December 10, 1908.

New York Harbor Line Board, 39 Whitehall Street, New York City.

GENTLEMEN: In order to save the time of this Board during the conduct of this hearing on the Passaic Valley Sewer,

I beg to submit in written form the protest of our City Improvement Society against this proposed sewer. While we realize that this question will be decided chiefly on engineering and scientific grounds, we feel that as a civic organization we should at least register one more protest against what must prove to be a serious invasion of the rights of the citizens of New York City to the enjoyment of life and the pursuit of happiness.

Respectfully yours,

CITY IMPROVEMENT SOCIETY."

The Chairman: The Board is now prepared to hear anything further on this subject that those present may care to offer.

Mr. Dean: Mr. Chairman and Gentlemen, we would like to ask Dr. Jackson if he objects to stating the conditions in Boston Harbor as he knows them as a comparison with the conditions in New York Harbor.

Dr. Jackson: I have been connected, as chemist and sanitary expert, with the New York Bay Pollution Commission, and the Metropolitan Sewerage Commission of New York, and am director of laboratories of the Department of Water Supply of that district; I am also a member of the Pollution Committee of the Merchants' Association.

The similarity between the conditions in Boston harbor and those in New York harbor have been pointed out, but I wish to bring out some very essential points of difference between the Boston
163 harbor conditions and those in New York.

The sewage of Boston harbor is screened, passed through four large settling tanks, through and under a large settling tunnel, in all of which places considerable sediment is removed. It is

then allowed to flow out at some depth to beyond Moon Island, and as it flows out, it is deposited only one hour after the ebb of the tide; in other words, they are very careful not to allow the sewage to flow during all periods, as it has been found that it would flow back into Boston harbor and cause serious detriment there.

The Chairman: What sewer is that?

Dr. Jackson: The Moon Island sewers in Boston. The sewage of the Boston sewers—

The Chairman: Is that the one that enters in just below Deer Island?

Dr. Jackson: No; the Deer Island and Nut Island are smaller sewers and of more recent construction. I am speaking of the main Boston construction, which is that of Moon Island, in the outer harbor.

Now, it was supposed that when the sewage was discharged there, it would become intimately mixed in the waters of Boston harbor. As a matter of fact, as it discharges below the surface, it immediately boils up and spreads out over the surface, and that is because of the difference in the specific gravity of the sewage due to a difference—some ten or twenty degrees, in temperature and due to the difference in weight between fresh and salt water, which immediately brings that sewage to the surface just as if it was in a funnel, and
164 if discharged at a lower point the diffusion is very slight causing it to float out over the surface.

The last time I was at Moon Island, and I went there particularly to see the beginning of the discharge and to watch it during the entire period, and I know that there was practically no diffusion. Of course, the discharge there was not so deep as it is intended here, but the point is that the discharge there—from different points—it was put below the surface, and it immediately rises up, boils up from six inches to a foot and spreads out over the territory there for several square miles, in fact over the distance of the water, that is, as far as you can see, all the way over to what is called Long Island.

Now, all the examinations that have been made of that water show that the sewage is all practically within six inches to a foot of the surface; in other words, it does not intimately mix up with the salt water, and on account of those conditions—the difference in specific gravity, and coming to the surface as it does, it is spread out on account of that same difference in the water—fresh and salt. Then, of course, after spreading out over this broad territory, it becomes more or less quiescent, and then deposition takes place.

Now there is another essential difference in Boston harbor as the rise of the tide there is from twelve to fourteen feet at that point whereas in New York harbor it is from four to six feet only and

that makes a very marked difference in the velocity which
165 would carry away these materials or depositions. The fact that the sewage here in this application, in New York harbor is to be deposited forty feet below the surface is not a very essential feature to my mind. I believe that that sewage, the moment it leaves the outfall, will rise suddenly to the surface, with considerable velocity, due to the quantity and due to the difference in the

rate of flow here and will, during the ebb tide, flow all the way between Robbins Reef, out through the Narrows and cause a disagreeable odor and unsightly appearance over that territory and during the flood tide will undoubtedly flow up around on both sides of Manhattan Island. There is no reason why this should not take place. The sewage which is deposited in the New York bay at the present time does exactly this same thing in a smaller way—on a smaller scale, for the reason that it is deposited in small outlets all the way 'round Manhattan Island, all the way around Brooklyn over a territory with a water line of perhaps thirty miles, and yet even with that distribution the sewage in New York harbor is practically all at the surface, all of the recent sewage and a chemical examination, and a bacteriological experiment and experiments which have been made and I have made most of them myself, show that this sewage is at the surface—all of the recent sewage—is at the surface of the water and down only a very slight distance is a very marked addition in the purity of the water—a marked difference in its purity.

Now, the first point is that the sewage will be spread out
166 over a very broad area of the harbor.

The next point is that the materials in suspension will be gradually deposited at points where the velocity has been slowed up.

The Merchants' Association feel that there is no valid reason why the sewage of the Passaic Valley should not be purified before it enters the waters of New York harbor.

Col. Knight: One or two questions, please:

Col. Roessler: I would like to ask this question: You refer to the rising of the sewage in Boston harbor due to the difference in temperature; is it not true that the temperature of the water in Boston harbor is quite a bit lower than the temperature of the water in New York harbor, and that therefore the difference between the temperature of the sewage and the water in which it is placed in Boston harbor is greater than the norm would be with reference to the Passaic Valley sewage and the waters of New York harbor?

Dr. Jackson: I did not say that there will be no difference—I do not get your point——

Col. Roessler: The temperature of the water is much lower up there——

Dr. Jackson: It is much lower there——

Col. Roessler: The temperature of the water up there is much lower than the temperature of the water in New York harbor is it not?

Dr. Jackson: Yes. In Boston harbor I was informed that the temperature which had been taken, the difference in temperature between the sewage and the water was about twenty
167 degrees; I am not sure of those figures, but that is what I was told there. I understand that the difference here in New York harbor would be between ten and twenty degrees.

Col. Roessler: Is that in Summer? That difference of twenty degrees between the temperatures of the sewage and the water in Bos-

ton harbor, you know that the water up there is considerably colder than it is here.

Dr. Jackson: That is a sort of average. My statement was that it is about ten to twenty degrees here.

Col. Roessler: In New York harbor?

Dr. Jackson: Yes, sir; I think it is a fair statement, from my experience.

Col. Knight: You referred to the velocity of the flow of the tide at the sewer outlet being greater in Boston harbor than it is in New York harbor; do you know actually what that velocity of flow is?

Dr. Jackson: No, sir; I only know that the difference in the tides is very considerable and naturally the velocity of the flow must be greater. I do not know the actual velocity.

There was one essential point I would like to bring out, which I forgot. In the Summer time, in New York harbor—in Boston harbor, I mean, there is a deposit of from two to eight feet of sewage sludge between Moon Island and Long Island. Every Summer. This sludge backs up on the right of the Boston harbor and on the right of the outlet so that there are considerable flats exposed,

168 of sewage sludge, during the Summer time. The engineer who put the water pipe from Moon Island to supply the water for Long Island had to cut through this sludge to get his pipe through and he cut through from two to eight feet of mud, sewage mud which he assured me had certainly the essential odor of sewage mud at that point, from two to eight feet depending on the contour, of course, eight feet in the deeper portions, as the sludge settles into those parts.

Now, the reason that there is not a very heavy deposit in Boston harbor is because, during the Winter time this sludge, which is deposited in large amounts over several miles of territory is broken up by the very heavy sea at that point during the Winter and is redistributed, so that it is not apparent there. Much of it naturally goes out to sea; some of it is distributed over the near portion of the harbor; at all events, if it were not for the Winter storms which create a very heavy and high seas which they have at that point the sludge there now would be much above the present surface of the water at high tide.

And I want to point out a strange thing, and it is that the conditions which occur in the Boston harbor during the Summer time, are the same conditions which occur in New York harbor throughout the year, and that that deposition which takes place in Boston during the Summer time, of this sewage sludge, is going to take place constantly in New York harbor, instead of intermittently as in Boston harbor.

The Chairman: You mean to say that New York would
169 not get the benefit of the very heavy Winter storms they get in Boston harbor and which serve to disperse this deposit as you have stated?

Dr. Jackson: In New York harbor they have a double protection against heavy storms; they have the outer bay and the quiet waters of the harbor, which are unusually quiet for a harbor.

Col. Knight: How far from the mouth of this sewer is the effect of that Boston sewage noted; how many miles from the mouth of the sewer, where it is discharged into the Bay?

Dr. Jackson: There is no apparent effect — inches from the mouth of the discharge sewer, which it has been in any way able to measure; there are certain deposits at varying distances—fully a half mile inland towards Boston.

Col. Knight: Well, how far will the tidal currents carry that sewage?

Dr. Jackson: When the sewage is discharged, there is a sharp line on the North of the discharge, this is apparent and defined, and from the temperature of the water which indicates where the sewage is.

Col. Knight: How far does the tidal current carry the sewage so discharged?

Dr. Jackson: It does not flow beyond that point only a matter of a few hundred feet.

Col. Knight: A few hundred feet?

Dr. Jackson: That sharp line, which you can see extending off for a couple of miles shows the battle between the sewage,
170 which would flow towards the harbor, and the very strong current which occurs during the time of the outfall, at the other edge of the outfall.

Col. Knight: But that discharge is made on the ebb?

Dr. Jackson: Always, and one hour after the beginning of it.

Col. Knight: Well, then, the following flood then does not carry it beyond this line of demarcation you have spoken of?

Dr. Jackson: That is a matter which is very difficult to judge.

Col. Knight: But you say this line is apparent and sharply defined, and I asked you how far the tidal current carried——

Dr. Jackson (interrupting): This line is surface water——

Col. Knight: The line you speak of is on the surface of the water and you are speaking of the mass of material coming at once to the surface of the water, so we are treating of what is floating on the surface; you find the line of demarcation about a half mile inland; do you ever find it further inland?

Dr. Jackson: No.

Col. Knight: Then the recurring current of the tide does not work this sewage up into Boston harbor?

Dr. Jackson: I spoke of the deposit——

171 Col. Knight: I am speaking of the surface indication——

Dr. Jackson: That I am not familiar with——

Col. Ruffner: How many hours did you watch this?

Dr. Jackson: About two hours.

Col. Ruffner: About the time of discharge?

Dr. Jackson: Yes,—just before the discharge until the end of it and kept track of the facts; of course, there is a discharge of two hours, starting one hour after the ebb tide starts.

Col. Knight: Well, then, how do you reach your conclusion, as you have stated it, that if this flood does not move this material inland in Boston harbor so far as the surface indications are concerned,

that the flood tide will move it from Robbins Reef up around on both sides of New York harbor?

Dr. Jackson: As I understand this proposition, that discharge is not on the ebb tide, but during the entire period, and, of course, the conditions under those circumstances would be utterly different; that is, during the flood tide, the disagreeable part of the material, and the odoriferous part of the material would be carried up the harbor and around the City, and, during the ebb tide, would be carried out of the harbor.

Col. Knight: But, from the Boston statement, I infer, then, that if it all goes out of the harbor on the ebb tide, as you say, the recurring flood tide does not bring it back.

Dr. Jackson: I think not to any great extent—I think that
172 is account- for by the fact that it is practically open sea there—And the islands——

Col. Knight: Then this material, down here, discharged on the current of the flood tide, could not go farther inland than one flood would bring it?

Dr. Jackson: No; I think not.

Col. Knight: How far—Do you know anything about the tidal velocity here on the flood tide?

Dr. Jackson: I have not been personally connected with that work—I know of it through other sources—I know that the floats charted by the Metropolitan Sewerage Commission would easily go beyond the City——

Col. Knight: What velocity do you get from that?

Dr. Jackson: That I am not familiar with; I do not know the velocity; I know the condition that the floats put in at Robbins Reef will go up just beyond the Narrows if put in at the beginning of the ebb——

Col. Knight: Will the recurring flood tide bring that back as far as Robbins Reef?

Dr. Jackson: Most of them were deposited on the North shore of the island——

Col. Knight: I know, but those that were not deposited on the North shore, of course, would they come back as far as Robbins Reef?

Dr. Jackson: Of course, they meet the Hudson River effect; there would be an oscillation in the harbor and always would ultimately pass out further——

173 Col. Knight: In other words, then, the material could not possibly go farther North—could not go upstream farther than one flood tide would bring it?

Dr. Jackson: No; of course there is a difference in high floods——

Col. Knight: I am speaking of the average conditions?

Dr. Jackson: That would be the case.

Col. Knight: Then how far is Robbins Reef below the Battery?

Dr. Jackson: I do not know the exact distance.

Col. Knight: Then, if you do not know the exact distance, and do not know the rate of flow of the current, how can you predicate that this stuff will come up here on both sides of New York?

Dr. Jackson: For the reason that the floats put in at the Battery will go down beyond Robbins Reef and back——

Col. Knight: But would they come back as far as they went down?

Dr. Jackson: Nearly as far.

Col. Knight: Well, then, you still do not say how you reach your conclusion,—if you do not know the rate of flow, the velocity, or the distance, I do not know how you can assert that that material will go that far——

Dr. Jackson: Well, the material being on the surface of the water will very likely go about the same distance as the floats will go, and while the velocity of these currents in New York harbor have
174 not been very well worked out, it is fair to assume that where the floats will go the surface material will go.

Col. Knight: But you do not know where the floats will go. You only say that some put in off Robbins Reef go down to the Narrows and come back nearly as far or pretty nearly as far, but you do not know anything about floats from Robbins Reef coming up on both sides and around the City of New York——

Dr. Jackson: I think that is a matter that Professor Landreth, who follows me, may be able to answer.

Col. Knight: I simply want to get a foundation for your remarks that this material will be carried up on both sides of New York, on the Hudson river side and in the East River on that side of the City——

Dr. Jackson: The matter of the velocities of tides and those matters are not in my province.

Col. Knight: Then your statement about the material coming up on both sides of the City is not based on actual knowledge?

Dr. Jackson: It is based on what has been done in connection with the pollution of the harbor by the New York Bay Pollution Commission and by the Metropolitan Sewerage Commission, and upon the results of the float work as seen and as charted by those bodies?

Col. Knight: But the report—You have seen the special report of the Passaic Valley Sewerage Commission?

Dr. Jackson: I am not familiar with it.

175 Col. Knight: Then you are not familiar with all its statements concerning the tides and the floats in that report?

Dr. Jackson: No, sir.

Col. Ruffner: I understand you were appearing as an expert on these matters?

Dr. Jackson: I am a sanitary expert and an expert on sanitary chemistry.

Col. Ruffner: You are an expert merely on the chemical side of the question?

Dr. Jackson: General sanitation.

Col. Ruffner: Then your assertions as to where this material is likely to go is not expert testimony?

Dr. Jackson: I draw my conclusions, my inferences from what I have seen——

Col. Ruffner: Just what you have seen of these charts of the founts?

Dr. Jackson: I have spent probably as much time on New York harbor, studying these matters as any other one man; I have collected the matters of research in pamphlets and they have been sent round to the various interests and engineers——

Col. Ruffner: You are not an expert on the flow of the tides and tidal action?

Dr. Jackson: Not on the flow of the tides.

Col. Knight: Now, then, that takes out your statement that this material would come up around on both side- of New York City. Now, then, you stated that this material when discharged from these pipes will rise at once to the surface, that because of the different density, specific gravity and temperature will bring it suddenly to the surface and that it will hang there and not be readily diffused——

Dr. Jackson: There should be some diffusion, of course,—there is some in Boston harbor——

Col. Knight: That is, by diffusion, you say; but by specific gravity, you say the effluent rises as a rule to the surface,—then how do you get the deposit in the bottom of the channel in the lower bay here?

Dr. Jackson: That is from different, heavy, material.

Col. Knight: But we have no heavy material,—you have described the amount of sedimentation—you have said that it goes through several settling tanks and through a long tunnel, and that then, as a result of lesser specific gravity, it rises at once to the surface; then where is the material going to come from that is going to fill up and diminish the navigable portion of the harbor?

Dr. Jackson: It is eventually deposited. As the result of the temperature, the suspended matter rises on being discharged, at once to the surface, and floats out over the surface, and then slowly deposits.

Col. Knight: What causes it to acquire the extra specific gravity, then, to drop it to the bottom of the bay?

Dr. Jackson: There is an action of salt water on sewage material which is productive of the condition which, I think Dr. Soper brought out yesterday,—there is a precipitating action on the material, the suspended matter in solution——

Col. Knight: What was brought out yesterday was a photograph showing vials of different colors,—but no determination as to the amount of sedimentation——

Dr. Jackson: And we know that in salt water the sedimentation is greater than in fresh water, and a great many experiments have been made to show that——

Col. Knight: But now, what proportion, say, of a cubic foot of sewage comes out and is kept afloat by this specific gravity that you referred to as being true out at Boston, what portion of a cubic foot of sewage, or of the heavy constituents of sewage thus in suspension as you have stated, just what part of that will ultimately be made

heavier than it was when it came out of the sewer so as to form the deposit—

Dr. Jackson: You mean the matter in suspension?

Col. Knight: This matter that changes somewhere by contact with sea water, changes its specific gravity and drops?

Dr. Jackson: The sewage precipitates in time, it changes its specific gravity in solution and is then deposited. It is, as you might say, when the matter is surrendered, the residual deposit, which is determined by the salt in the water.

Col. Knight: Have you ever determined the parts in a thousand that that heavy matter that is deposited or precipitated form; have you ever determined how many parts in a thousand of ordinary sewage?

Dr. Jackson: That, of course, differs very widely with different sewages.

Col. Knight: Have you determined it for any of them?

Dr. Jackson: The chief pollution in suspension would naturally precipitate in course of time—only a question of time.

Col. Knight: Specify it; its volume; does it vary? Can you tell me between what limits it varies? Don't you see, the important feature is, here, if there is going to be an interference with navigation due to shoaling of the waters due to deposits, it is important to establish the rate of that deposit. Now, if you can give anything definite bearing on that, it is important to present it. You appear now without any special information as to the tides or currents, but you do appear here as a chemist: Now, can you tell us, from any analysis or from your observations of any sewage, how much sewage, solid matter, in parts to the thousand, will be discharged after this process that you spoke of, at Boston, has been completed?

Dr. Jackson: I should say, anywhere from two hundred to one thousand parts in a million; that is, one thousand parts in a million would be one part in a thousand.

Col. Knight: That is based upon your own knowledge?

179 Dr. Jackson: That is a general statement, based upon examinations of a great many sewages.

Col. Knight: Based upon your own examination?

Dr. Jackson: Yes, sir. I have had a great many years' experience and have made a very considerable study of the sewages of different cities—

Col. Knight: We are not asking that. From the fact of your appearing here as a witness on behalf of the opponents of this application, we take it for granted that you are present as an expert. Now, as the result of your own work, can you tell us anything as to that proportion? You say, from two hundred to one thousand parts in a million: Is that based on actual examination you have made?

Dr. Jackson: It is based on actual examinations I have made at Boston. The one part in a thousand is probably the amount that would occur at this point.

Col. Knight: You can say then, that from two hundred to one thousand parts in a million will be discharged, or may be expected to be discharged in Boston by this system after all of this process is

completed, or is this the part you find in sewage before it is subjected to any treatment whatever?

Dr. Jackson: That is the proportion I find in the sewage before treatment.

Col. Knight: Now, how much of this is removed by screening and sedimentation in the Boston treatment?

Dr. Jackson: In the Boston treatment, it is somewhere about one-half that is removed. But those figures of two hundred parts to the million will not apply to Boston.

180 Col. Knight: Well, we will take one in a thousand as the base. You say you think one-half of that is removed? Have you any means of determining—have you any measure—or have you ever measured it? Or, have you determined it by the amount of material you find in deposit in the plant as a result of the process of purification?

Dr. Jackson: I was assuming those figures from the analyses of the difference between the two; between that which goes over to Moon Island and that which flows out,—that which goes to the pumps.

Col. Knight: Then you have analyzed this discharge?

Dr. Jackson: I have not analyzed it myself.

Col. Knight: But you know—

Dr. Jackson: I have seen analyses, and I have also taken samples which I have been examining recently. The difference in that sewage over in Boston harbor as between ordinary sewages is very considerable. I would not think that that sewage would be a representative one or that it would represent what we would get here, for the reason that my examinations there of the compressibility of that sewage, which I have been making recently, have had very surprising results,—I have found that the compressibility there is as one to ten, that is, it requires the addition of ten parts of dilution to one part of sewage to prevent a disagreeable odor, whereas in ordinary sewages it will run as high as one to twenty or even one to thirty, so that that sewage is hardly representative of this.

181 Col. Knight: But, in fact, it is important. That brings us down to five hundred parts out of a million,—five hundred parts of material that can be positively deposited after discharge, out of a million that go to the works. That is, you remove one-half of one thousand, which leaves five hundred parts to the million to be discharged.

Dr. Jackson: In Boston—

Col. Knight: In Boston,—I am still speaking about Boston—what is the allowance of sewage per capita; of what does that sewage consist before treated; is it a separate system, or not?

Dr. Jackson: It is separate there for Moon Island, yes, sir—

Col. Knight: But does it take the sewage,—does it take all the sewage from Boston, or if, in Boston, the storm sewage separated from this? I want to know what goes into this plant?

Dr. Jackson: The Metropolitan Sewerage—

Col. Knight: Now you said—I am talking about the Moon Island sewer,—is that a separate system?

Dr. Jackson: Yes, sir; it is a separate system.

Col. Knight: In other words, nothing goes into that sewer, but the ordinary house sewage and factory waste?

Dr. Jackson: The ordinary sewage and waste; most of the storm water is cut out.

Col. Knight: What is the allowance,—the amount of sewage per head in Boston?

Dr. Jackson: I think about one hundred gallons.

182 Col. Knight: One hundred gallons?

Dr. Jackson: I think it is one hundred gallons per day.

Col. Knight: Then this is practically the same—or, is there any trade waste in that?

Dr. Jackson: I should assume there would be some.

Col. Knight: Do you think it is practically the same amount per head as is considered there in the Passaic Valley proposition?

Dr. Jackson: Yes. The difference in what is deposited, however, there would be a difference,—the large settling tanks and in the long tunnel in which they also settle out their material and remove it before they deposit it into the harbor.

Col. Knight: You said, remove it from that long tunnel; is that done?

Dr. Jackson: I understand it is shut down—shut off and the material is taken out occasionally.

Col. Knight: Taken out, how?

Dr. Jackson: Either pumped or shoveled out.

Col. Knight: Then it must be agitated, or mixed up?

Dr. Jackson: I think so.

Col. Knight: It would be best to do that on this tunnel here, would it not?

Dr. Jackson: It would be best to make such an arrangement.

183 Col. Knight: Now, another matter, with respect to that sewage running up on both sides of New York harbor, you know nothing about the preponderance of the ebb discharge of the East River over the flood?

Dr. Jackson: During the flood tide the Hudson River flows down into the sea, and then flows out again.

Col. Knight: How about the East River?

Dr. Jackson: The East River flows eastwardly during that time.

Col. Knight: During the flood?

Dr. Jackson: Yes.

Col. Knight: Well, now then, during the ebb the East River goes down this (indicating) way; does it run about the same quantity as the Hudson river? Are the quantities—the contents of the tide in the rivers equal?

Dr. Jackson: Probably not; I do not know that that has ever been determined.

Col. Knight: Oh, yes; it has decidedly been determined. There are four hundred million cubic feet preponderance from the East River on the ebb tide over the Hudson river: Have you any condition like that in Boston?

Dr. Jackson: The conditions in Boston are that there are a number of small islands out above this point.

Col. Knight: I know, but have you anything like that tidal discharge, any single preponderant of four hundred million cubic feet? Have you anything corresponding to that as a method of dilution in Boston?

184 Dr. Jackson: I do not think there is any great difference between the discharge through the East River and the discharge through those various islands in different directions in Boston harbor; the action of the tide is about the same.

Col. Knight: I think the hydrographic conditions are entirely different there.

Do you know anything about—since you say you have been studying this sewage here—do you know anything about the sewage down at Gowanus Canal? And Newtown Creek?

Dr. Jackson: I do; I have made a great many examinations of it.

Col. Knight: Well, how would you compare the condition of the sewage at the head of that Creek and at the mouth of it?

Dr. Jackson: At the head of Gowanus Canal it is a very strong quality of sewage—

Col. Knight: Yes?

Dr. Jackson: As it goes further down it is diluted by factory waste; there is a great deal of precipitation from those wastes, and at the outlet it is somewhat more diluted than the ordinary sewage, but much worse at the surface than below—through the Oak Run—

Col. Knight: How would it compare at the mouth with the Boston sewage,—just at the mouth,—not at the top of the Canal,—not the sewage after it is treated by those works, but as it goes into those works?

185 Dr. Jackson: In appearance, it is very much darker—the comparison is not a very good one for the reason that we have factory waste there, which has a precipitating action in the Canal itself, and the conditions are entirely different, but a comparison—

Col. Knight: Well, you have the standards by which you compare sewage—whether sewage is harmless or not,—you have the comparisons to determine the degree of contamination in the water, haven't you?

Dr. Jackson: Yes; I should say that our chief comparative requirements are provided for, and the prospect of precipitation, the amount of water necessary add to that sewage to keep it from giving off a strong odor on incubation.

Col. Knight: The amount of water to keep it from giving off a strong odor,—then, taking that sewage at Boston, do you know what amount of water would keep that from being offensive?

Dr. Jackson: About one to ten, I should say, or less.

Col. Knight: Then, you would want to dilute it about one to ten?

Dr. Jackson: Yes. Ordinary sewage is diluted about one to twenty.

Col. Knight: Ordinary sewage? This Boston sewage is only half, as compared with ordinary sewage? Boston sewage is only half as strong, do you mean to say?

Dr. Jackson: That particular sewage is weaker in precipitates.

186 Col. Knight: This sewage which comes out of the Boston sewer, treated at Moon Island, you rate that as only half as strong as the ordinary sewage?

Dr. Jackson: Yes. I do not know that—Yes, I think I can safely say that. I have made precipitation tests on it which gave that result, in many tests, too.

Col. Knight: Has any test been made of that water at Gowanus?

Dr. Jackson: Yes; the proportion is as one to thirty there; it is stronger there.

Col. Knight: One to thirty at the mouth or the head?

Dr. Jackson: At the middle of it. I should say one to twenty at the mouth.

Col. Knight: Then, taking it as one to thirty, what do you mean by that, in ordinary English?

Dr. Jackson: The amount of material which is there, would have a decomposing action, would be strong enough, if thirty parts of water is added to it, and it is allowed to settle, and it is allowed to stand with the sediment in it, it will develop a strong odor, and lose all of its oxygen, all of the air which is in solution,—that is the test of the organic strength of it.

Col. Knight: Then, it is still harmful after that dilution of thirty to one?

Dr. Jackson: At that point it will just putresce, beyond that point it will not.

Col. Knight: Then thirty-one to one would make it safe,
187 and remove the offensive character?

Dr. Jackson: I do not know as to safe; but it would remove the offensive character.

Col. Knight: Well, then, eleven to one would remove the offensive character at Boston?

Dr. Jackson: It would, if diluted with the water, but if it is floating out over the surface, it does not have the same effect. We know very well that the offensive character is not removed on the surface of Boston harbor, for the reason that you can smell it, a very strong stench, over a very wide area: That is just the point; that it is not diluted.

Col. Knight: Well, what measures have been taken down at Gowanus creek or Gowanus channel to clarify or purify that?

Dr. Jackson: We are installing a pumping station to flush out the channel.

Col. Knight: What is the discharge of the creek?

Dr. Jackson: Those figures,—the amount of the discharge, are not within my province.

Col. Knight: You do not know, then, of any relation between the

discharge of the creek and the capacity of the discharge pumps in the pumping station?

Dr. Jackson: No.

Col. Knight: You do not know the proportion of water that is to be furnished to dilute that?

Dr. Jackson: No, sir: The action is one of flushing, as I understand it. They are to remove all the material, I understand, 188 flush it out into the harbor.

Just one other point, if I may: You spoke of that strong discharge of the East River, into New York Harbor. That is true, in volume, but it does not have the effect that would naturally be supposed, for the reason that a very large portion of it is an under-run, rather than at the surface, and we have got to consider these matters from the surface conditions, that is, raw sewage from surface conditions rather than under-run, and the same is true of the under-run at the Narrows; the solution is not the same as to the volume of the under-run, it is the volume of the surface—

Col. Knight: You are speaking of an under-run: Do you know the extent of the under-run?

Dr. Jackson: I know it is a strong under-run.

Col. Knight: Do you know how it affects the surface?

Dr. Jackson: I know that the under-run is of comparatively clear water, and that the sewage is at the top,—on the surface—

Col. Knight: Do you know how far the under-run tide water goes in the Hudson river?

Dr. Jackson: I know it goes a long distance up the river.

Col. Knight: Do you know how deep the under-run is in the East River?

Dr. Jackson: No, sir.

Col. Knight: Then, how can you say its condition?

189 Dr. Jackson: From the conditions apparent in the appearance and in the position of the sewage itself.

Col. Knight: If the waters of the East River have got to go over a shoal—as it does—varying in depth from thirteen and a half to eighteen feet, how does that bear out your statement as to the under-run?

Dr. Jackson: I have made an examination by solution, for instance, of the amount of chlorine in the water of the under-run, and the difference from the surface is very material; if you go down just below the surface, it is one-half that at the surface,—and you get a considerable difference at varying depths, in the salts, and we have made a cross-section of the chlorine in the Hudson river, and we have found the fresh water and sewage practically all at the top, and that the salt water flows out underneath.

Col. Knight: Then, this precipitation which you say takes place of this matter in suspension because of the specific gravity,—that you believe is all on the surface, in the fresh water?

Dr. Jackson: Very largely at the top.

Col. Knight: Then you say something about this matter going back into the salt water, and being precipitated by the salt water, insolution, with an increase in the specific gravity?

Dr. Jackson: The fresh water is at the very top where the sewage is discharged into the salt water at the outfall, it boils right
 190 up to the surface, and above the surface, then gradually becomes quiescent, and the part which precipitates comes in contact with the salt water?

Col. Knight: When you spoke of the volume, as to so many parts in a million, the dilution was to be all by water?

Dr. Jackson: All by water.

Mr. Child: May I have the privilege of presenting, as part of the case of the petitioners, certain extracts which I have caused to be made from the United States Coast Survey Reports?

The Chairman: Do you wish it to form part of the record?

Mr. Child: If I may.

The Chairman: That will be done.

(The following was submitted):

"Extracts from United States Coast Survey Reports:

In our opinion the conservation of ample channel ways at Sandy Hook is due in some measure to the tidal circulation which the Hell Gate entrance permits. This circulation is the life-blood of the harbor, cleansing the channels from the silts of its rivers, as well as from the sewerage of its cities, and even sweeping the sands from its grand avenue to the ocean.

New York Harbor is visited by two derivations from the tide wave of the ocean, one of which approaches by way of Long Island Sound, the other by way of Sandy Hook entrance. These two tides
 191 meet and cross or over-lap each other at Hell Gate; and since they differ from each other in times and heights they cause contrasts of water elevations between the Sound and the Harbor, which call into existence the violent currents that traverse the East River.

Extract from U. S. Coast Survey 1867, pp. 158 and 159.

Two tide waves visit New York Harbor, meeting and overlapping at Hell Gate.

(2) Near the meeting point of these two tides the observed heights and times of the compound tide are intermediate.

(3) The currents of Hell Gate are called into existence by the variations in the relative heights of the Sound and Harbor; their epochs have no direct relations with those of the local tide, or its components, and their velocities do not depend upon the local rates of rise or fall of tide.

(4) The current flowing westward through Hell Gate occupies a greater section than that flowing to the eastward, because the former prevails during higher stages of the local tide than the latter.

U. S. Coast Survey, 1867, p. 161.

Although the tidal currents of New York, especially in the East River, appear to move to and fro with ebb and flood in monotonous repetition, like the swing of the pendulum, there is a net gain, under ordinary conditions of river discharge to the westward, i. e., a perma-

192 nent transfer of water from the Sound through the Harbor and out into the ocean over Sandy Hook Bar. This statement, if true, involves so many consequences affecting the condition of the Harbor (its navigation and its improvement) that I have put it in the form of a proposition to be demonstrated, first, from the most general relations of the Sound and Harbor tides, as oscillations of the sea "interfering" at Hell Gate; and second, from a strictly inductive study of gaugings made by different observers at different dates. I shall show that it ought to be theoretically, and then show that it is true practically.

U. S. Coast Survey, 1886, Page 409.

The peculiar quality of the East River current as compared with the free tidal current is that the former is a gravity stream, namely it is water running down a slope, as in a fresh water river.

U. S. Coast Survey, 1886, Page 410.

Although the Hudson, and other rivers flow into New York Harbor, and slightly raise its level, the conditions illustrated in our diagram are very nearly realized in the Seasons when the fresh water discharges at a minimum. One of these Seasons is the Autumn; the other is mid-winter when the land waters are ice bound. At such times the greater velocity being westward, and the greater depth of water being that of the westerly flow, there is, as a net result, a circulation of sea water through the Harbor from the Sound to the Ocean. In Mid-Winter this circulation renewing the water before it can get chilled, and lowering the freezing point by mixing sea water with the river discharge, serves to keep the port open
193 to commerce. One may form some estimate of the value of the four degrees difference of the freezing points between sea and river waters when it is remembered that in severe Winters Halifax, Portland and Boston have not closed before Philadelphia or even Baltimore.

The indirect value of this influx from the Sound during the dry Season lies in the partial supply of the under-run of sea water which occurs when the head of the river is insufficient to counterbalance the greater density of the sea water. We do not find this under-run (or preponderance of inflow) at higher levels than the deepest channel beds of the bar except on rare occasions; but one may easily see that the withdrawal of the influx from the Sound would cause the bar to rise and work inward. The fresh waters that enter from the Hudson and other streams play an insignificant part in the physics of the Harbor; but the circulation of the sea by way of the East River, although small in quantity, is the element which determines the superiority of New York Harbor over nearly all the sand barred inlets of the World. It is this circulation which keeps the port open in Winter and sweeps the sand from its threshold.

U. S. Coast Survey, 1886, page 411.

The whole amount of water which flows into the New York Harbor in the course of each tide through the East River is sufficient of

itself to raise the water of the Harbor by one foot and one tenth.

The ebb commences two hours before the turn of the tide in
194 the East River and during these two hours the flow is toward

the East River instead of from it. Next the amount of flow into the Harbor must be proportionately diminished and reduced to nine tenths (.9) of a foot. Now the Harbor at high tide has four and two tenths (4.2) more of water in it than at low tide, which runs out during the ebb, together with the flow from the Hudson, which is about the same as that of East River. The whole of the flow then through the Narrows which is independent of East River, corresponds to five and three tenths (5.3) feet in elevation of the surface of the Harbor, and this is the amount which would run if East River were to be cut off. The additional nine tenths (.9) of a foot which arises from East River gives a total of six and two tenths (6.2) feet as representing the flow through the Narrows and over the Bar. If the East River were cut off, the corresponding decrease in the flow of water would involve a proportionate decrease in the water-space over the bar or a reduction of the depth of water upon the bar of about three feet and a half. Such is the measure of the importance of East River to the preservation of the entrance to New York Harbor. The loss of this river would involve a fatal injury to the Harbor and any obstruction to its flow or reduction of its capacity must be proportionately injurious.

U. S. Coast Survey, 1871, Page 110.

Computations made upon the observations at different depths in 1858 gave for the discharge of the Hudson, at the close of the set

Season (1st June), 6,038,000,000 of cubic feet, and at the
195 close of the dry season (September) 3,360,000,000. Our more
extended observation of 1872 (October) give nearly equal in

flow and outflows amounting to 4,511,000,000, which is about the mean of the two gaugings of 1858. Now this added to the ebb volume of the East River, which was 4,383,000,000, gives 8,894,000,000. If to this we add the Harbor tidal prism 17,862,000,000, (which includes Newark and Raritan Bays, and the Kills), we have 26,756,000,000 of cubic feet. The gauging across the mouth of the Harbor from Sandy Hook to Coney Island gave, from observations of 1858, an outflow of 27,663,000,000 of cubic feet, which is only about two and one half per cent. more than the preceding computation.

* * * Without claiming that all the water which comes in through the East River goes out over the Bar, and aids in the scour of its channel, I think this computation authorizes us to regard the East River stream as too important to be treated lightly.

I must add one general statement concerning a harbor with two or more outlets. It does not follow even when such a Harbor is visited by only one tide that there is a disadvantage in having more than one pathway to the sea, on the contrary a majority of the first class harbors of the world have several. Among sands it is not wholly upon the strength of the current that effective scour depends, but upon the power of these to dispose of the material advantageously. Equal and opposite tidal currents, however strong, cannot remove

the bars of our southern inlets, because in the short period of
 196 six hours the very slow dune-like movement of the sand has
 not carried it beyond the influence of the adverse stream
 with which it works back to its old place; but where the ebb and
 flood are unequal, the material is swept entirely away from the mouth
 of the harbor. Now, with harbors of two outlets, it often happens
 (and I speak here with plenty of observed data at my command)
 that one channel is more favorably situated for discharge than the
 other, so that, in effect, there is a circulation in at one door and
 out at the other.

U. S. Coast Survey, 1871, Page 118-119."

Mr. Dean: Captain Parsons, who spoke yesterday, and who was
 formerly president of the Maritime Exchange, would like to add a
 little further to what he said.

Captain Parsons: Mr. Chairman and Members of the Board, in
 my desire to be explicit, and not occupy valuable time, I omitted
 some things that it was desired I should refer to. One of those was
 the effect of the sewage upon the metal on the bottoms of wood
 vessels loading in localities where the water is perceptibly polluted,
 say, for instance, that at Newtown Creek. Vessels going into New-
 town Creek, and loading with oil, have frequently—with a new coat
 of metal, have frequently been obliged to re-metal their vessels at
 their destination on account of the metal having been perforated by
 the chemical action of this polluted water. So much so has this pre-
 vailed and to such an extent that frequently merchants in charter-
 ing freight vessels to load here have excepted Newtown Creek
 197 from the privileges of the parties making the charter as to
 the parts of the City where vessels might be loaded.

Another was that, of the amount of expense incurred in dredging
 out the piers and wharves, caused by the deposits, made annually,
 in 1905, I must speak from memory because I have mislaid the
 document which I had secured, in 1905, over \$800,000.00 was ex-
 pended in dredging the slips and wharves just on account of this
 deposit made from the matter contained in the water where there
 was no action of tides, and this was very largely augmented by
 amounts expended by private individuals and for private wharves
 and piers, which must be done by themselves, in order to enable
 them to receive vessels drawing a reasonable draught of water.

The question of carrying the sewage directly to sea, which has
 been a prevalent opinion, until this matter was discussed a few years
 ago, has been very conclusively proved to be an error from the fact
 that the current—for instance, objects spread,—started from the
 Battery, even on the first of the ebb tide, will not reach the sea,
 but when in the lower bay, down within four or five or six miles of
 Sandy Hook, will meet the flood tide and be deflected into the bays,
 that which is further up, into the lower or Gravesend Bay, and that
 in the lower bay takes a circuit and finally comes back up through
 the Narrows again into the lower Bay.

I referred yesterday to the filling up of channels across
 198 which the tide flowed rather than through them directly.
 This, of course, occurs where the channels are shallow, where

they are used mostly by our smaller class of vessels and so largely has this prevailed, that some of the anchorages used by this small class of vessels, such as the bay into which the Gowanus canal enters, the charter has found have been shoaled to such an extent as to almost practically destroy their usefulness to owners of vessels who have been formerly in the habit of anchoring in those places.

I was asked in reference to the apparent quantity of sewage in New York Bay and in the lower Bay, out where it could be seen. I desire to say that in my personal connection as a navigator in this Bay and in this Harbor, that it is not much in evidence in the stress of the current. That part of the harbor and bay which is used by the larger vessels it does not appear except the lighter material which floats on the surface. I have seen a dead horse make excursions up and down the river until he finally decided to locate himself somewhere along the South shore of Raritan Bay, but, ordinarily, the sewage is not much in evidence; but it is in the water and deposits itself along the shores. I have noticed upon a comparatively flat or sloping beach that the largest amount of the deposit was at the point of high water, but that it prevailed all the way down this sloping beach until it reached the flat surface, diminishing in quantity, usually, that there was more of it on the surface, but that it was

199 continually settling wherever the water was not in action.

In making the statements which I have made yesterday and to-day, I make them, not so much as an expert as from the viewpoint of a practical observer, and coming in contact with these interests to which I have alluded. The questions to which I referred yesterday, of its affecting the paint of vessels, that also shows very plainly over the painted surface as there will be a well-defined water-line derived from contact with the surface of the liquid around the vessel the paint of which is light-colored enough to permit it to be shown or which can be readily discovered even in black paint. I believe that is all.

Col. Ruffner: I want to ask you one question, if you please: What, if any efforts have been made by the municipal authorities to lessen the amount of destructive material poured now by the sewers into Newtown Creek, and what difference has that made?

Captain Parsons: I know that some efforts have been made; I know that the question has been very thoroughly discussed from time to time but up to the present time I know of no material improvement. I know that one year ago we had a vessel of about one thousand tons capacity that was painted white inside, that is all her waist and houses, etc. were painted white, and she went into Newtown Creek to load, and her captain requested me to go over and see the vessel because she was in such fine condition. I went over when he had been there two days, and the vessel, all her white paint, had turned almost black and there was nothing about
200 the appearance of the vessel which would invite the inspection of one who felt any interest in her. That, I will say, was just about one year ago.

Col. Knight: I would like to ask, in connection with your re-

marks about that, I would like to call your attention to this extract from the New York Bay Pollution Commission report: "That the reduction in the numbers with the depth is striking and indicates that most of the sewage and other decomposable refuse with which the bacteria were associated was floating around at the surface and not mixing uniformly with the water." That is from the report of the Pollution Commission of New York City.

Captain Parsons: Well, I remember reading that document.

Col. Knight: But you disagree with that?

Captain Parsons: I disagree with that to this extent—as I said,—but there is more of it manifest upon the surface; that is, more of it deposited at the surface of the high water, yet it prevails all the way down as far as you can see it where the water leaves the ground.

Col. Knight: Well, if you could judge by simple figures, the difference between five feet and forty feet is the difference between one hundred per cent. and twenty-five per cent.; that is simply the report—taking those figures for it——

Capt. Parsons: A vessel that is so unfortunate as to be sunk in those waters anywhere around where Gowanus enters the bay, will immediately commence to accumulate a deposit of sediment
201 and the expense of the removal of that sediment from the vessel is very often equal to the expense of raising her, so thoroughly has this deposited itself all over the inside of the vessel, adding greatly to the weight of the vessel and making the raising of the vessel that much more difficult.

Mr. Dean: Mr. Chairman and Gentlemen, the next speaker we have to offer is Professor Landreth of Union University and dean of the engineering school there and who, for ten years, was consulting engineer to the New York State Department of Health, besides a great deal of other experience. He has not prepared a set speech and it may be found convenient, to jog his memory, if I may be permitted to ask him a few questions as he goes along in the stages of the questions or subjects we expect him to talk on.

Prof. Landreth: Mr. Chairman, I have been asked to say at first a few words concerning an outline of the history of the activity and the position which has been taken by the State of New York with regard to the comprehensive question of the sewage of this Metropolitan district, regardless of State laws, not only as a proof of the activity of the State of New York and in its efforts to solve this matter comprehensively and effectively, but also as a basis for just one or two statements I wish to make concerning my personal observations in the Harbor.

In the year 1903, I think it was, the State of New Jersey,
202 by the Passaic Valley Sewerage Commission, first proposed to discharge sewage into New York Bay. At that time the State Commissioner of Health of the State of New York determined to investigate the fact, and, on inquiring, concluded that it was a matter of sufficient importance to draw it to the attention of the Governor; which he did. The Governor at once concluded that a commission of inquiry was desirable and a bill was accordingly, at his request, passed by the legislature of that year, providing for the

establishment of a New York State Commission, or, better, called the New York Bay Pollution Commission having for its object principally the examination of the relation of the proposed sewerage discharge from New Jersey into New York Bay and its probable effect on the commerce and navigation of the bay, as well as its sanitary relation.

On studying the question for a year or so, that Commission, first, reached the conclusion that it was undesirable that that sewer should be constructed; secondly, that the question was not a small one, and that it was not confined to the case of the Passaic Valley sewer, but that many other problems were concerned intimately with it, first of all the problem of the disposal of the sewage of New York, Greater New York and, as a corollary to that, to dispose of and purify the sewage of the metropolitan district; and that Commission reported: in its report it recommended the establishment of a commission of wider power which should coöperate with a similar one from the State of New Jersey to study the matter in a comprehensive way, and to reach conclusions as to the ultimate disposal of the
203 sewage of the entire district so that whatever efforts should be made for the adoption of such plans should be made along comprehensive lines and should not result in the throwing away of useful funds and efforts, but in the correction of abuses.

Thereupon the State of New York provided a second Commission, the term of the first having expired, after, in fact, having been extended by request of the Governor, for a year to take the matter up more fully, and in the latter part of 1905 the State of New York established a second Commission, called the Metropolitan Sewerage Commission of New York, and while that was a Commission established by the State, the expenses of the commission were to be paid by the City of New York and the appointments were made by the Mayor of the City of New York, and that Commission commenced its inquiry in 1906, and is still in existence.

For the first, I may say that I was a member of the New York Bay Pollution Commission, and, also, for a year and a half a member of the Metropolitan Sewerage Commission. I say that simply to explain my reason for appearing before you and stating these facts.

Now, the efforts of the State of New York to coöperate with the State of New Jersey have not been satisfactory. An invitation from the State, through the Secretary of State to the Governor of New Jersey to have a similar body appointed resulted in the matter being referred by the Governor
204 to the State Board of Health of New Jersey, and no satisfactory coöperation ever resulted from that Board, so that the State inquiry as to the ultimate disposal of the sewage of the entire district has been carried on by the two States distinctly and independently, without coöperation. So much, Mr. Chairman, as the basis for the observations which I am to refer to.

The question as to the swing of the tides and the swing of the sewage borne above them in the Harbor has been mentioned. Floats placed in the harbor at different points at the beginning of the ebb

tide, make trips of different lengths according to the state of the tide, whether it is neap tide or spring tide; also according to the direction of the wind, although precautions have been taken to eliminate as far as possible the influence of the wind, that has not been fully successful, so that the lengths of the runs are not entirely sustained,—they are modified or disturbed by the effect of the wind. They, usually however, may be said to represent the flow of a float of from ten to fifteen miles, consequently the flow of the flood for that distance. Floats have been placed at the Battery at the beginning of the ebb and have passed out as far as Sandy Hook. At other observations, the floats have not gone so far. Similarly, floats have been placed at Sandy Hook which have come up above Robbins Reef, and where observations have been made——

The Chairman: That is on the flood tide?

Prof. Landreth: That is on the flood tide, yes, sir; and in some instances they have shoaled on the shore. The swing of the tide does occur. These observations leave the progression, besides, towards the sea; that is, the movement is clearly towards the sea, but it is by no means an overwhelming one.

These observations, coupled also with observations of the density of the water as determined by current determinations, indicate that about one-half or something less than half of the water which goes out of the Narrows never returns; that the remainder is the same water which went out. That fact is, I suppose, largely accounted for by the fact that the sea-way beyond the bar is not an open sea entirely but is confined between the two lands at right angles,—the Jersey shore on the North shore, of Long Island shore Eastwards, and it disappears into that, acquiring a large standard figure of the flood tide drawn up in the same way and returns in part the same water that went out on the ebb.

Concerning the matter of deposit, the borings that have been made,—a good many borings have been made on the bottom of the harbor by apparatus designed for bringing up samples not only from the surface but from several points below the surface simultaneously, and these borings show very general deposits of mud, largely organic in appearance and, as far as can be detected, it has the organic contents, all the essentials of organic sewage which has passed through a fairly advanced stage of decomposition and some of it having, at last, reached the mineral stage, where it is generally similar to natural mineral material and it all contains the characteristic sewage indicator, the *B. coli* communis. At a depth of from six to eight feet, as I recall—I am speaking from recollection merely—I am not positive how deep the *B. coli* is observed in the mud, it is very general, however for the first foot or two, in fact in some cases increasing frequently as the distance into the mud is penetrated and rapidly diminishing below that point——

Mr. Dean: Professor, what would that *B. coli* show?

Prof. Landreth: The *B. coli* would show original sewage or animal contamination.

Those, gentlemen, are much better observed where—that is I speak as to the phenomena—on the inner slope of the bar at Ambrose

Channel, and the observations which were made at the available places, indicated, as you of course know, quite a large amount of organic matter, of harbor sludge or harbor deposits has formed on the inner slope of the bar. Borings from there involved a cross-section of the bar where the sand is fairly clean, to a depth of eight to twelve feet on the inner point of the slope and diminishing then up to the normal shoaler flatness further up the Bay, suggesting a possible explanation that in the efforts of the material in going back and forth and lying close to the bottom, still moving partly in the sand wave, to reach the sea, but practically moving back and forth in the same place, partially influenced by the current, somewhat will accumulate on the bar.

I should like to add only one or two words to the exposition of the Boston construction and the conditions there as compared with New York, which Dr. Jackson very clearly set forth, and that is, to emphasize the fact that New York has one outlet to the sea through which sewage may pass, and doubtless a remote one through the East River channel, whereas Boston has five or six, contributing, therefore, to a much more effective mixture of sewage with water in the case of Boston than in the case of New York. I should say that doubtless very little of the sewage of New York Bay does pass out through the East River; the borings into the channel of the East River and all the analyses that were sent to us showed a practically clean bottom. No deposits, practically, were found in large portions of the channel of the East River.

Mr. Dean: What would you say with reference to the proximity of the sea, at the Boston outlet, as compared with the proximity of the sea at the New York outlet?

Prof. Landreth: I should call it open sea just beyond the islands, in the case of Boston outlet; it is so cleanly swept by the winds and by the ocean movements there, and not at all land-locked as in the present case, as it is but a short distance from the margin or border of Boston harbor out to the open sea; of course, the depths are not as deep as they are farther off coast, but there is a clear and undisturbed sea movement, both of the waves and of the winds and, as far as the purposes of dilution are concerned, it is practically adjacent to the sea.

Col. Knight: But as far as currents for removal are concerned, not as good as the currents coming down East River?

Prof. Landreth: I am hardly prepared to say that.

Some comment was made yesterday as to the prevalence of activity in sewage disposal in this country. I have simply jotted down some of the sewage disposal plants built in the State of New York; a large number of other cities in the country are considering the matter; some have actually built plants; most are in course of investigation; the construction that has already taken place in this State of sewage disposal plants has been in the following places—this is not at all complete, and depends on my memory—At Albion, there is a sewage disposal plant for the State institution; Rockport has one of a municipal nature, constructed and maintained by the corporation; so also,

with Depew; so also with Doala; so also at Far Rockaway, and I might say that they are now investigating the matter with a view to the establishment of a plant at Sheepshead Bay; at Skaneateles they have a plant either under investigation or actual construction at the present time; the City of Hudson has a plant for the treatment of a portion of its sewage; I should say, that the City of Hudson has a State institution. The City of Kingston has been treating part of its sewage. The village of Saratoga has a complete plant for all of its sewage, which has been very successful; the village of Ballston treats all of its sewage; the City of Gloversville does a portion of its sewage and is investigating the question more fully before embarking on a complete plant. The village of East Syracuse has a plant; the village of Auburn has one plant just about done and are advising as to the construction of another. The City of St. Louis, as you may know, is considering this matter. Of the remainder of the cities,—I may say that there is a number of small institutions and villages, smaller than those I have mentioned which have this matter actively under consideration or are actually constructing plants. Thank you, gentlemen.

Mr. Dean: Professor, with reference to the tendency of the sewage to rise as soon as it comes from the opening of the sewer into the bay, and then its future course, taking up the question of sedimentation; what would you say on that?

Prof. Landreth: Well, as a matter of observation that sewage does rise on its discharge from the sewer into the bay; it is a matter of speculation as to what happens then, but it is a matter of observation that sewage sludge is found on the bottom; we can only conclude that it must have been deposited after having first come to the surface; we know that some of the material does deposit at once,—the mineral portion; it is a fact that the sewage does float and does deposit, and where these conditions predominate there are two complaints, the surface complaint and the bottom complaint.

Mr. Dean: Then, Professor, what would you say with reference to the percentage of solids, organic and inorganic, in sewage in solution as compared with that in suspension, and the possibility of the removal of either by any method?

Prof. Landreth: Ordinary sewage will usually show a larger proportion of its solids in a state of solution; I would say, from fifty to seventy per cent., will be in solution, and, sometimes, the percentage is higher than that, and the remainder, from twenty-five to fifty per cent., will be in suspension.

Now, as the action of sea water, like the action of other precipitating channels may be, and in many cases is, to change the state of some of the dissolved matter into suspended matter, by rendering it insoluble, and causing it to precipitate.

This is markedly the case in artificial experiments to determine the effect of salt water, and it is exactly the case in the sewage of Worcester, Massachusetts—which is an iron-manufacturing town, that is, its interests are very largely concerned with the manufacture of small iron products, and many of them employ the galvanizing processes, in which the thickening of the iron is part of the opera-

tion. The thickening is done by the use of sulphuric acid, and the effect of the operation, besides thickening the iron, is to produce a residual sulphate of iron, which is a precipitating chemical.

The action of that chemical, as it is discharged into the sewers, is shown in the results of the tests, in the sewage plants there, in which a larger portion of the solids which are in solution, are
211 converted into solids in suspension, than is the case in sewages where this precipitating chemical is not present.

Manchester, England, is a somewhat similar case, but to a lesser degree. Manchester has some industries similar to those at Worcester.

Col. Knight: Do you know who were the engineers for the State Sewerage Commission, about 1902?

Prof. Landreth: Of New York,—or New Jersey? I have forgotten.

Col. Knight: New York?

Prof. Landreth: Of the State Sewerage Commission? I have forgotten.

Col. Knight: I have an extract here of the report of that Commission, which shows, among others, Messrs. Rudolph Hering,—J. J. R. Croes,—as engineers of the State Sewerage Commission of New York. Now, you are in a position to know something as to the reputation of engineers, are you not?

Prof. Landreth: Yes, sir; somewhat.

Col. Knight: Are you sufficiently posted to pass upon whether the reputation of those men is above the average as experts on this subject?

Prof. Landreth: Decidedly above the average; yes, sir.

Col. Knight: Decidedly above the average; their opinions should be given weight above the average?

Prof. Landreth: I should say above the average.

212 Col. Knight: Now, this is taken from their report (Reading):

"The sewage should, therefore, be partially purified; that is, as far as it is practicable, by works on the Newark Meadows, before being discharged into Newark Bay, or, it must be carried five miles further, and discharged in its raw or crude state, into deep water of the upper bay of New York, where there is a large volume of water and a strong current to insure thorough dilution and inoffensive dispersion. * * * The outfall of the sewage would leave the shore at an elevation of about twenty feet above high water and extend about two miles into the bay to a point North of Robbins Reef ledge, practically in the centre of the bay, in the vicinity of which the channel is seventy feet in depth."

That is the statement then, of those men, whose reputation is far above the average, and are to be given, in the expression of their opinions, credence above the average statement—

Prof. Landreth: Their reputation, I think, is far above the average—

Col. Knight: Well, have you anything—do you care to say anything to gainsay that or in opposition or in refutation of it?

Prof. Landreth: I do not wish to question the good judgment of men who have seen the service and who possess the ability of those engineers; it is sufficient for me to say that they were engaged by and were reporting for and in the interests of the Passaic Valley and not of New York or the entire district. Just how far they took into consideration, in an impartial manner, the conditions and effects on other communities and other States, I am not advised. I infer that they gave that some consideration.

Col. Knight: You have nothing, then, definite, to advance in argument against that statement?

Prof. Landreth: Simply that I could not agree with that statement as to its probable effect on New York harbor conditions; looking at it in a broad and large sense, without regard to State lines at all I do not consider (and I do not offer my opinion as equal to Mr. Hering) I do not consider, myself, however, that it is a desirable thing to discharge sewage in the form proposed into New York harbor. That is my view; that is just my view, based on my observation and experience; however, I do not suggest that it has as strong weight as that of the New Jersey engineers there stated.

Col. Knight: But you admit this part of it—

Prof. Landreth: That part is a matter of opinion—

Col. Knight (continuing): You admit that part of it is a matter of opinion; but you admit that there is a large volume of water and a strong current to insure a thorough dilution—would you admit—

Prof. Landreth (interrupting): I would admit that there is a large volume of water and a strong current; but I am not positive that it does always insure "thorough dilution."

Col. Knight: You are not positive about that?

Prof. Landreth: No, sir.

Mr. Dean: Mr. Chairman and Gentlemen: With reference to the last point which you brought out, about the difference of opinion among the engineers, as Professor Landreth would not wish to contradict the opinion of all those gentlemen, with your permission I would like to read a paragraph of the opinion of Professor Allen Hazen: That extract is as follows (page 28):

"With regard to the Robbins Reef outlet, such a diversity of opinion exists among the engineers as to the probable nuisance that would be created by the Passaic Valley sewage if allowed an outlet at this point, that it would be advisable to have the combined action of New York and New Jersey sewage commissions to determine whether this outlet would be practicable."

And, another quotation, a short quotation, on page 93 of the same report:

"It must be admitted that New York is better off without the discharge of New Jersey sewage. The discharge of sewage will tend to pollute the Bay locally. There will be an appearance of sewage for some distance around the proposed outlet, and this outlet is near the main channel up the harbor. There will be some odor, and from the sewage will smoothe the waves and show its presence

over a considerable area. To a certain extent these phenomena are disagreeable and objectionable, and if New York could compel them to build the sewer or dispose of the sewage without damage to others, it is clearly for her interest to do so."

215 That is the opinion of one of their own engineers.

Mr. Riker: Won't you read the next sentence?

Mr. Dean: Shall I read the next sentence, that he wishes me to read?

Col. Knight: If you please.

Mr. Dean: At the request of the attorney for the petitioners, I read:

"New York is now putting practically all her own sewage into the harbor."

And that is a point which I did not wish to touch on, but, since they have brought it up, and with your permission, I would like to say a word on that point: The conditions are not at all similar between the deposits of the sewage of New York City and that of the proposed Passaic Valley sewage, for this reason: that the sewage from New York City, including Manhattan Island and the other boroughs of Bronx, Brooklyn or Kings, Richmond and Queens, finds its way into the water along an immense shore-line through a great many sewer outlets which have been counted and, as I recollect, number three hundred and sixty; this allows an immense amount of dilution with the water contained in the different rivers and it furnishes an entirely different example than where an immense amount of sewage is discharged through one opening in one particular place.

Assuming that there is, and will be, an immense volume of water passing over the Robbins Reef outlet, for a certain area the sewage,

216 as we have heard, will tend to rise, and cannot possibly mix with the immense volume of water which is at that outlet, and would result in this sewage passing out and spreading out over the surface of the entire width of the channel.

Referring back to the disposal of the New York City sewage, we must consider that the sewers of New York City have been constructed during a long period of time, ever since New York City was a small village; and it is only in the light of recent discoveries and experiments in sanitary science that methods have been discovered for disposing of sewage, and that many different plans have been considered for disposing of the sewage of New York City, and that some plans have been discussed and are, in fact, under very serious consideration at the present time, by which New York City can take care of its sewage.

Some two or three weeks ago, I had the pleasure of appearing before Governor Hughes in reference to the pollution of the Hudson River, on the request of some twelve hundred petitioners who were complaining, and Governor Hughes said at that time that it was one of the most important matters that had come before him during his administration, and that he hoped that some comprehensive plan would be devised within a short time to take care of the polluted condition of our rivers and our harbor.

I am also informed, by the State Commissioner of Health (Dr. Porter, who appeared here yesterday) that steps were being taken to amend the public health laws in New York State in this re-

It is quite true that the laws of New York are not, at the present time, sufficient to wipe out the nuisances which are now arising. Efforts have been made in this direction, but the laws at the present time are in such a condition that we cannot compel a municipal or individual interest to stop polluting the rivers or to stop polluting the harbor. All that the law permits, in this State, at the present time, is that no new sewers can be constructed without permission given by the State Department of Health, and Dr. Porter put himself on record here as to the policy he has pursued on behalf of the State to prevent further pollution of the waters of the State by sewage. He is utterly opposed to the construction of sewers in the future, and he has refused permission to sewers wherever he could do so; he is urging the cities, both large and small, and municipalities all over the State, to put in disposal plants.

When we consider that only fifteen years ago, the first disposal plant was in practical operation in New York State, we can see that this is only a recent movement, and that some time must necessarily be taken before the laws can be brought to a condition where they can, in a comprehensive manner, dispose of these questions.

At the present time, a nuisance may be taken care of by the local boards of health, but as Governor Hughes said, or intimated, the trouble with the law is that the local boards of health often fail in their duty owing to the fact that they are generally doctors or men who have other connections with the large business interests, and they do not wish to antagonize their clients or the local interests, and that the laws must be amended so that the necessary action can be placed in the hands of the State Department of Health—as it is in Pennsylvania—and that is the action we hope to take.

As Professor Landreth pointed out, action has been taken by this State looking towards some comprehensive coöperation in this matter of sewage disposal, with New Jersey. In 1904, the Commission of which he was a member, the New York Bay Pollution Commission, held two meetings with the State of New Jersey commissioners, but so far as reaching any conclusion is concerned, they have been without any result.

As I pointed out, the offensive results of the New York City sewage, are not the same as would be from this big sewer, as proposed. In the present light of sanitary science, there is apparently no excuse why such an immense big sewer should be built. Considering the two applications, it is estimated that the sewage of New York City amounts to five hundred million gallons per day. These gentlemen propose, as you know, to discharge, at the beginning, one hundred and twenty million gallons per day, running up to an average, as Mr. Harrison stated yesterday, of two hundred and fifty million gallons further per day, and they estimate a maximum capacity of

three hundred and sixty seven million gallons per day. Of course, that is the maximum; but the policy of this State, and, I might say, the policy of New Jersey, at the present time, is towards correcting these sanitary evils.

219 It must be remembered that the Passaic Valley Sewerage Commission is a local body, and is not amenable to the State Department of Health of New Jersey, in its action. I would like to add that the reports, which I gather from the newspapers are, that the State Department of Health of New Jersey has recently taken action against the cities of Riverton and Camden, on the Delaware River, and Phillipsburg, also on the Delaware, and Seabright, on the Shrewsbury, to compel those cities to stop polluting those rivers; so that the State of New Jersey has placed itself on record as being opposed to pollution, while this Commission, which is not amenable to any State Department of Health of any State whatsoever, is seeking, in its own way, to dispose of its own sewage, without reference to what the effect may be upon the surrounding country.

I would like, if possible, but the time does not permit, to go into the alternatives which they may take up if they choose; but I would like to refer to just one statement that Mr. Hering made at Montclair, on October 20th which I personally heard; that, if this trunk sewer were not to be constructed, then they could build a sprinkler and filter which would do the same work, and that that sprinkler and filter could not be smelt five hundred or six hundred feet away from it, and that it would be cheaper to construct that sprinkler and filter than it would be to construct the tunnel which would extend through this territory from the shore of Newark Bay and under Newark Bay, with the accessories, out to New
220 York Bay. He said that it would be cheaper to construct that disposal plant than to construct the other system,—the trunk sewer, although it would cost slightly more to maintain it—

Mr. Riker: That statement applied to Montclair only, as to the cost, on account of its location, and did not apply to the other communities who are concerned in this project—

Mr. Dean: I did not understand it that way—

Mr. Riker: Why, certainly, the question that was discussed was as to the cost to Montclair—

Mr. Dean: I will question Mr. Hering—

Mr. Hering: My statement was that we might have to consider the erection of a sprinkler plant in time—

Mr. Riker: The question being whether Montclair would come into this project with the other municipalities, and the chief question referred to was the price to that community, to Montclair, and Mr. Hering's statement was that the filter arrangement would be more expensive—

Mr. Dean: Mr. Hering, does that statement in fact conform to your recollection,—is it in conformity with your remarks then?

Mr. Hering: I am sorry to be obliged to differ with the Judge. I was asked to go out to Montclair, to go to a meeting of citizens,

there, to inform them what the plan was, of the Passaic Valley Sewerage Commission; what they were going to do, because most of them were in ignorance of the details, and part is correct, what the gentleman has said, that I said it will cost less money
 221 to put in a disposal works to purify the sewage of the whole district, but it will cost so much more to maintain it; that, estimating, as we should do in every business into which intelligent business men embark, the sinking funds, depreciation, interest on the amount invested, plus operating expenses, the total real cost of the work is greater, not cheaper; that Montclair would have to pay more if her sewage were purified in a disposal plant in the Newark Meadows, than she would if the trunk sewer was built as proposed—that is what I said.

Mr. Dean: May I be permitted to ask a question? If the individual municipalities in this district build their own disposal plants, would it not be more expensive to them—would they not make money by joining in the building of this trunk sewer?

Col. Knight: The answer to that is?

Mr. Hering: The initial cost, where such plants could be erected at all, might be less, would very probably be less, but the cost of maintenance would undoubtedly be greater.

Mr. Dean: May I call the Board's attention to a paragraph or two in a letter written by Col. D. W. Lockwood, of the Corps of Engineers, U. S. A., dated February 2d, 1907, with reference to the disposal of the Bronx sewage? Shall I read these two paragraphs, or simply put the matter into the record?

The Chairman: Read it.

Mr. Dean: The letter—in a part of the letter, it says,
 222 with reference to the Bronx sewer:

"The effect of sewage discharged into the waters of New York harbor is shown by material being removed at the North end of Ambrose Channel and through channels elsewhere. To be sure, this discharge has been going on for a long time, but it is increasing very rapidly, and before many years it will be found not only desirable, but imperative that some comprehensive system of sewage disposal other than that now in use be adopted which will keep the solid constituents out of the harbor, besides rendering innocuous the liquids allowed to run, as now. The proposed sewer will add but little to the present unsatisfactory sewage conditions prevailing and from the best sources of information available it appears that the quantity of solid matter which it will carry to the river will be comparatively small, at least for a number of years. It is therefore recommended that no objections be raised to its installation, particularly as it would be included in any general plan for reorganizing the sewage system to the New York harbor that may come up in the future."

I wish to add that the population which will drain into the Bronx sewer at the beginning would be at the rate of only from twenty thousand to forty thousand people, so that it cannot be considered as a precedent for discharging the sewage of the Passaic Valley into the bay.

With reference to another letter, a letter of this Board, dated, New York City, May 28th, 1897, at page 53 of the report of the commission on the sewage disposal of the city of Paterson. This letter, of the Harbor Line Board signed by the engineers, refers to the refusal of a permit to discharge sewage into Newark Bay, at which time it was estimated, in the third paragraph on page 53, that the entire amount of sewage which would be deposited in Newark Bay would amount to seven hundred and fifty-five thousand gallons per day; and, in the next to the last paragraph on the same page, it reads as follows:—from the printed report of the engineers on the question of the sewage disposal of Paterson—

The Chairman: Is that signed by Col. Robert?

Mr. Dean: Yes, sir; Col. Roberts and Raymond—

The Chairman: That was in 1897?

Mr. Dean: Yes, sir; and, of course, the conditions are worse now than they were then.

(Reading:) "The estimated annual deposit of six hundred and fifty thousand cubic yards of solid material in the lower end of Newark Bay, following the adoption of the proposed sewage system, would fill up the entire area of the Bay below the proposed sewer outlet, from bank to bank to the depth of about one-third of a foot annually if evenly distributed. As the existing average depth of the flats, except in the narrower width of the mud adjacent, is about four feet at mean low water, it is easy to see that it will require only a few years to make the proposed sewer system not only a public nuisance, but a serious obstruction to the navigable waters adjacent to the harbor of New York.

224 "The Board is of the opinion that, as a general rule, when it is desirable to discharge sewage or other material into tidal waters, it should be at points where natural deep water exists and not in the vicinity of artificial channels which require periodical dredging for their maintenance.

"Newark Bay is a land-locked tidal basin of considerable area, with comparatively small outlets, through which it will always be difficult to maintain channels of a depth adequate for navigation.

"The Board is of the opinion that it is not advisable to permit the use of such a basin as a receptacle for a large and constantly increasing amount of sewage.

"Even if the dilution of the sewage for which provision is now contemplated should be sufficient to prevent serious deposits, it is certain that the amount of discharge will rapidly increase and eventually produce shoaling in the channel.

"The Commission recognizes the fact that this sewage cannot be indefinitely emptied into the waters of the Bay, and that a time will come when other means must be adopted for its disposal.

"The Board concurs in the opinion of the District Engineer that the disposal of the sewage of the lower Passaic district in the waters of Newark Bay will be detrimental to the interests of navigation."

I wish to add that this subject was further considered by the Military Secretary, Acting Secretary of War, as late as August 3d, 1906, the letter of whom appears on page 55,—it

does not state his name—of the same book, which I will not read, but it is to the same effect.

We have not attempted to estimate the entire solid contents of this sewage as will be discharged, and I simply wish to call to your attention that the average daily flow at the end of this period, at 1940, is estimated, as they say, at two hundred and fifty million gallons, which would be slightly over three times the amount they formerly proposed to empty into Newark Bay; and I also wish to add that if they are of the opinion that the sewage will be so clarified (that is the word which was used yesterday) in their proposed scheme, why should they go to the trouble and expense of building a tunnel under New York bay,—why do not they admit it into Newark Bay, instead of going to the expense of building this large tunnel? I think that the fact that they are expecting to build such a tunnel is an admission on their part that they would feel it to be folly to apply to this Board for permission to dump it into Newark Bay in the face of this report of the Board.

Col. Knight: Do you make no distinction between the physical conditions of Newark Bay and those of New York Bay? Of course, that has everything to do with the matter. The Harbor Line Board, whose report you have read, rejected an application for a discharge sewer into Newark Bay because of certain conditions,—do those conditions hold in New York Bay? As to artificial channels?

Mr. Dean: Of course, there are artificial channels in New York Bay.—Ambrose Channel and other channels with which you gentlemen are much more familiar than I am, as a lawyer. We have had some testimony as to the amount of dredging occurring in slips and piers at the present time, and if a comprehensive scheme is fulfilled, to prevent New York City from the affliction of the offensiveness of this sewage, then the construction of this sewer would be a very great discouragement towards following out a comprehensive plan, and would, on the other hand, counterbalance any removal of sewage which New York City might be able to make of her own.

Then, the other reasons why these are to a large extent similar, is owing to the under-run which I admit is somewhat indefinite, and I can only refer your Board to the report of the Department of the Interior of 1886, or 1887, I think it is 1886, in which the subject of the under-run is considered. That shows that the water nearer the bottom of the Bay tends to stand still or, if anything, to move up towards the Hudson River and that while the current on the surface of the water may be going out, the under-run is coming up, and that the under-run under any conditions, even at the end of the ebb tide, does not go out as far or with as great velocity as the water does at the surface, which would show that the specific gravity—it is due to the specific gravity—keeps that water more at a standstill near the bottom, and that this stuff there, the sediment and the precipitants from the sewage,—as the chemical and bacteriological action takes place on the surface of the water, it sinks down into this water of greater density and washes back and forth on the bottom and settles near the bottom. Of course, the freshets in the

Hudson River would have a very large effect and tend to wash it out to a large extent, but in the late Summer or Early Spring, when the ice is still in the river, the water of the Hudson does not push the tide out as far, and that deeper, or underrun goes away up the Hudson River. That, of course, is all technical, but I am stating that as mere facts which I have derived from studying the different reports to which I have referred.

Col. Knight: Well, as regards the conclusions you can reach there, from studies of those different reports, you differ apparently with what we learned from the gentleman you asked to explain these matters to us——

Mr. Dean: Professor Landreth——

Col. Knight: You have had a statement from him as to the clear condition that the bottom of the East River is in, have you not? That was his statement, that it was clear?

Mr. Dean: Along the bottom of the East River?

Col. Knight: The East River; yes.

Mr. Dean: My impression from studying the different reports is——

Col. Knight: I only want his statement——

(The stenographer could not immediately locate in his notes that portion of Professor Landreth's remarks, and Professor Landreth was recalled.)

228 Prof. Landreth: I do not recall the exact form of my affirmation: I wished then to make it clear that the East River was the only spot where we found a clean bottom, in the harbor of New York.

Col. Knight: Now, then, in the report of the New York Bay Pollution Commission, they say the following: "From examinations of samples there, the water of the East River is shown to be very much more polluted, lately for many years than the waters of the Harlem or Hudson Rivers. * * * It was therefore decidedly more polluted". Consequently, in view of this statement, we would not expect that in waters which are more polluted, we would find, in that place, a clean bottom, unless you admit that there is some credit to be placed in the statements about the scouring power of those waters,—the preponderance of the ebb tide of the East River down through that channel.

Mr. Dean: I think that in explanation of those tests it can be said that those tests were made on the surface of the water——

Col. Knight: That is where you say this sewage is.

Mr. Dean: The bacterial action takes place, in a large preponderance, near the surface of the water, and as the bacterial action takes place, it decomposes this organic matter, which, as it decomposes, goes to the bottom.

Col. Knight: That is just what I say; you do not find it in the bottom, the current carries it away.

Mr. Dean: But the Department Reports will show, undoubtedly,

229 that there is a stronger current in the East River than there is in the Hudson.

Col. Knight: Well, that water which comes down during ebb tide on the East River must continue out and does continue out.

Mr. Dean: I believe I recollect reading of the large body of water going through the Bay.

Mr. Ackerman: In this Hazen report, just referred to, I want to say I was secretary of the joint committee, and, in the clause quoted by Mr. Dean in reference to the appearance of the sewage for some distance around the proposed outlet, Mr. Hazen's deductions were made at that time on observations of the Moon Island and Deer Island outlets, the Nut Island outlet not then having been completed—

Mr. Riker: In Boston—

Mr. Ackerman: In Boston. And, furthermore, Mr. Hazen, at that time, had no plans of the Passaic Valley Commission; he was acting solely for Paterson, and was obliged to make his own observations, his entire observations, his own figures, from looking up the figures previously reported by the Passaic Valley Commission.

In view of the fact that Dr. Soper presented a paper yesterday, and Mr. Hazen's name has been mentioned, I wish to call the attention of this Board to a paper enclosed in this report (referring to book in hands of speaker) on the discharge of sewage on the New York side, being a discussion by Allen Hazen of a paper presented by Dr. Soper, to the Society of Sanitary Engineers of Boston, and on page 142: (Reading)—

230 "The quantity of water that comes into the New York harbor through the Narrows, and goes out again, if reduced to cubic feet per second, is a tremendous quantity; altogether, it represents a flow of over three cubic feet per second per thousand of population for one hundred million people. That is a pretty large population,—more than the present population of the whole United States, but there can be no doubt that, diluting the sewage from it, with this amount of clean, cool, sea water, and with the strong tidal currents which exist, would render it innocuous and inoffensive."

On page 143 (Reading):

"Of course, it is also true that when New York reaches a population of twenty-five million, a great deal of it will be on Staten Island and on Long Island and so located that it will not discharge its sewage into the ocean through the barred harbor, and these computations that we previously make do not take into account the conditions of the lower harbor which are undoubtedly vastly more favorable for the dispersion of sewage, and so it looks as if it may be centuries rather than decades to the time when radical measures for purifying the sewage of New York City will be required."

I ask you to accept this report to the Board (proffers book, which is accepted by the Chairman, with thanks).

Mr. Lebkuueher: I desire to ask the privilege of the Board and the Government, as represented by the Board, to give us permission to refute some of the statements that have been made in
231 opposition to this application; for instance, the Boston harbor discharge was referred to and only the Moon Island discharge

of that City, whereas there are three discharge points in Boston harbor, and the one referred to is the oldest one of all, which has been in existence, as I understand, for over thirty years, and found to be inadequate, and newer ones have been installed on more modern lines—plans. Now, generally speaking, we all admit that it has been found that the sewage problem is one of the problems of the civilized world,—all over the world,—the civilized world, and it has been said that, fortunate are those communities who, located near the sea, where there can be a discharge of sewage by dilution. We fully understand—as a member of this Commission I desire the members of this Board to understand that this Commission has made a thorough study of all methods of sewage disposal and the trouble about the disposal of sewage is universal,—all over the world, except where it can be diluted in sea water.

This past Summer I made it my business to study sewage disposal works and observe them, and I have gone to Europe, and in England,—made it my business to see what is being done in that line, and, while theoretically, sewage can be disposed of artificially, through filtration or sprinkling systems, sedimentation, and all that sort of thing, I want to say that I did not see a single disposal plant that was theoretically perfect,—that is, up to the theory of the engineers of the disposal plants; these disposal plants were all
 232 practically alike, all more or less of a nuisance; it didn't make any difference which system was in use, they were all more or less nuisances; sometimes they worked all night; sometimes they did not.

Now, in this matter of the disposal of the Passaic Valley sewage, our law allows each community to dispose of it as it sees fit,—to go into contracts with this Commission, and to make one job of it, or to dispose of its sewage as best it may.

We think, and it seems to me that it is very evident, that this section is a part of the metropolitan district; it gets its population because of the metropolitan district, and it seems to me unthinkable that there should be twenty separate disposal plants, one for each of those municipalities to be installed in order to get rid of the sewage.

The matter has been thoroughly studied, and I do not understand how the New York people can come here and ask the privilege of continuing the disposal of the sewage of ten times as many inhabitants in the bay and harbor of New York, and then object to the extra one-tenth from a community which is a part of this same district.

And, furthermore, we have made a study of it as to the question of pollution, and for that very reason it is that we want to diffuse it as much as possible; the idea is to have a large area on the bottom of the bay, with very many openings to give it ample chance of dispersion and assimilation.

As long as the population of that district was small, the
 233 Passaic River was amply able to take care of it,—it dissipated it, or ate it,—for that is what water does with sewage if the pollution is ample; and we feel sure that there will be no perceptible pollution on the plans as outlined by our engineers.

I would like Mr. Hering to explain why some of the statements made by the opponents are not fully correct as far as the Boston situation goes.

Mr. Hering: Gentlemen: When I was here yesterday, I did not know that I would have to say anything about this matter, and I was absolutely unprepared, and I had an engagement last evening,—so I did not prepare a statement for you, but I will speak off-hand, as my memory recalls such things as have been said.

I, first, would like the privilege of answering Mr. Landreth. I would not like to have the Commission believe, for a moment, that my principles of life were not different from those which I am afraid you might infer from what Professor Landreth stated. I never engage as a partisan in any piece of work, whether I am testifying in court, or whether I am engaged by a municipality.

When I was engaged by the Passaic Valley Sewerage Commission to suggest to them what they should do here, I might have said,—“Discharge it just like Hoboken does,—just like Jersey City does, right out of the sewers,” the way New York City allows it to be done. I did not. I, realizing that this was a community only

234 theoretically separated by the State lines, recommended,—my recommendation was that it should be put where it will not harm the City of New York or this great metropolis, although it required New Jersey to spend a good many million dollars more to do the work just for that purpose, and no other. That was my recommendation, and no other. I was just as much looking out for the interests of New York as New Jersey, although I had no New York position at that time.

I would also like to answer my friend, Dr. Jackson, who, I think, perhaps misrepresented himself in some respect to your Body, in speaking only of the Moon Island sewage disposal of Boston, and perhaps thus leading us to suppose that that was what is going to be done here.

I remember when the Moon Island plant was built; I know why it was designed just as it was; I knew the chief engineer very well, visiting the work while under construction. It was the best system then known to deal with this sewage, and also the least expensive one for that part of Boston. They all saw the objectionable features of that method of disposal, and the next opportunity they had, to put in the works at Deer Island, they used a very different method there: Why? Because better. They discharge at all times; they do not do as at Moon Island, start up after the ebb tide has begun, and where they partially purify the discharge as at Moon Island, we will say that it does discharge on the surface,—the effects are not so bad as some of the stuff that floats around the harbor of New York to-day; and I would like to say that I have been out there a number of times,—only a year ago again, and that was dispersed entirely, so that you cannot see it, inside of two hours,—although the surface is black appearing and offensive, especially after you get out a mile or two,—I think it is possibly all gone—

235 The Chairman: Where is that? Deer Island?

Mr. Hering: That is at Moon Island. Now, at Deer Island they discharge this sewage at all times; they bring it out and turn the pipe up, in an upward direction, quite near the surface, so that at low tide you can actually see the rise of the water, due to the forces of the discharge, raising the surface, and as it is quite near the surface, naturally you see it flowing over the surface there. That is not the right way to dispose of sewage; they realized that,—so, when they built the other work at Nut Island, they discharged it at the bottom, further down, so that it has a greater distance to come up before reaching the surface, and in my humble opinion I think it is an error, the way they have built it, because they have carried the whole pipe right straight out to the outfall, giving this fresh water sewage a velocity, I think of three or four feet a second to start right up to the surface, and, naturally, it comes up to the surface if it gets a push equal to that, and yet, notwithstanding this condition, *this* added velocity, and the single discharge, it is not nearly as perceptible as at Deer Island.

I think that the method proposed here, which is to discharge it in small outlets for dispersion, is far in advance of anything at Boston, and will be effectual. Then, another matter, to obviate this velocity, this shooting up,—as has been stated,—the proposition here
236 is to discharge it horizontally, which is much better, because it shoots out at a velocity of about three feet a second, and now, discharged horizontally, it has got to come to a dead stop before it can move in a vertical direction, and then, with the vertical openings in the horizontal discharge pipes, there is nothing to give it a push upward, nothing to cause it to rise up; therefore, the tendency to go up will be much less here than in any of the outlets at Boston. Besides, we all know that a small stream will disperse very much more rapidly in the element into which it is discharged than a large stream. This you can see even if you have a pitcher of water, or, perhaps, a tank, and you squirt into it a stream of water, perhaps a quarter of an inch in volume, dirty water squirted into your receptacle, and you will see how very rapidly it is dispersed.

I think that the Moon Island proposition as mentioned here is not at all to be compared with what we are going to do, and even the other plants at Boston, which I have mentioned, I think should not be compared, and the effect on the surface of the water ought not to be compared with what you are going to have here, because of the reasons that have been stated, and the different methods of dispersion suggested.

The Chairman: You say that the sewage that comes out at Deer Island outlet has been treated before it is discharged?

Mr. Hering: Well, it is screened partially; and right there I might take up the question of screening again: The screens
237 there (Deer Island) I believe, are one inch apart,—I am not sure but I should like to state, in view of the fact that yesterday some weight seemed to be given to the fact that there was no specification of just how the sewage was going to be screened and how it was going to be settled; I would like to reply to that.

This matter of screening is a subject that has been studied very

carefully for the last two years; in Europe we saw all sorts of screens there,—wide ones, of an inch opening, down to a millimeter. Measurements, of course, have been made as to what that takes out, and there is not such a great lot of difference; the results vary from ten to twenty-five per cent. of the entire suspended matter.

Now, the finest screens that I have been able to find in use were in Europe, and we have, I think, one of the finest in the world here in this country, and they do not take out twenty-five per cent. of the suspended matter. Now, what is the difference? Is there a great difference between ten and twenty-five per cent. as regards this proposition? I do not think so. The difference is here: you must take out everything that is visible; everything that is large, and those are the screens that are proposed to be put in here, and all the screening used in Europe is that they take out all the larger matter,—there is no percentage there.

But, when you speak of the suspended matter in general, you must include, also, the very fine matter which goes through the
 238 screen, and which is the bulk of the matter. There is another difficult point,—you might ask, how could that statement throw a great deal of light on the subject? That is, to be more definite about it, we have a difference here: we have the Paterson sewage, coming down twenty miles through the sewers, all broken up, yet going through the screens, in a different condition from what the Newark sewage would go. That whole proposition is so complicated that it can be worked out only after a good deal of study and observation of it, and so on, for which no funds have yet been spent, and which, I must remark, must bear some relation to the amount of dilution necessary at that time,—because we know the screens will do the work. That settles this point.

Now, about the question of sedimentation; that is a question that has never been settled because it was, in the first place, a question of funds, and rather a complicated study, and chiefly because the Commission thought your Honorable Body, or the Army, would designate how much of that sediment would have to be kept out, and that merely means making the tanks a little larger or smaller; that is all it means, and, in the estimate of cost, enough was put in to cover that, so that I do not see that that is such a great thing to be known before you can say whether this proposition is worthy of adoption or not.

I was asked yesterday to get some information on the solid matters: I have had but very little time to look up this matter, and you
 239 know that sewage is a very changeable matter. You cannot give an analysis and say that that holds good for all cases.

Now, take, for instance, the European and American sewages; our sewage is about twice as dilute, and sometimes three or four times as dilute as European sewage. I stated, yesterday, that the amount of suspended organic matter in sewage was one in five thousand. Well, I was not certain about it, and I did not wish it to be held down to that; and now I find that that is the English figure; in our country it would be one in ten thousand parts because our sewage is twice as dilute. That is the suspended organic matter,—that which

fouls, or part of which fouls. Then the suspended mineral matter. This must be determined by the fact as to whether you have a combined system or a separate system,—which is a very different matter. If you have a combined system, you get all of your street wash, and that is a great deal; that is mineral. The abrasions from the street and from the horses' hoofs and the quantity of iron is quite material, and dust, mineral dust, and so on. So, I am now giving you a figure for the separate system, because this is to be a separate system (although temporarily Newark and Paterson still have combined systems, but for their own interest financially they will have to change and get separate systems). In a separate system, the suspended mineral matter is, taken roughly, one in twenty-thousand, or, the dissolved mineral matter is about one in six thousand. Now, there, you have got a general composition of the sewage, but it is very rough, because you really should have the particular kind
 240 of sewage that you are treating with, and that is the general average of American conditions.

Col. Knight: What was your third figure there,—the dissolved mineral?

Mr. Hering: One in six thousand.

Now, I have already stated that the proportion of solid organic matter which can be screened out varies from fifteen to twenty-five per cent; that is the solid organic matter that can be screened out, and that is all that will float in this case.

With reference to the sedimentation tanks, as I say, they have not been designed; they can be designed on the basis of whatever figure is given by the United States Government. For instance, let me say, if you build your tanks so as to reduce the velocity to about six inches per second—I cannot state now that that is the figure to be adopted, it is not settled,—you can get out from one-half to one-third of the deposit matter—six inch velocity per second in the sediment tanks,—six inches sediment. Now, that is the figure that has been used elsewhere, and it is about right.

Now, I want to say that what does not deposit will go on, and go into the river. That is so fine that it makes the water look dark. I have here some data about the observations that were made by the Commission for Additional Water Supply in New York some years ago,—in 1903, in New York, as to the attributes of the water in the

Hudson River at Poughkeepsie, and when I say that the suspended matter that is, the organic matter, is one part in ten
 241 thousand, I mean one hundred parts in a million. That is merely as a measure, because I am going to give you now some of the properties of the water of the Hudson River, coming down from Poughkeepsie to the Battery. They range, of course, from nothing, which is clear water, sometimes, to four hundred parts to the million, and that is four times greater than the amount of suspended animal matter that would remain in the sewage, or would be in the sewage discharged after this sedimenting—no, without the sedimenting—that, that is without the sedimentation; that is all that would remain in the water not sedimented, in the unsedimented sewage,—about

four hundred parts in the million; that is the maximum that I see here during the month of March.

The data runs from two hundred to four hundred, two hundred and eighty, and so on, so that we have this point in view, that this suspended matter is very fine, particularly after the sewage passes through the systems of purification, after being screened and flowing through the purification works, that it has no more suspended matter than the river carries with it into which you are going to discharge. The plans call for the putting in of a basin or basins to remove the putrescent matter, and this is provided for and is part of the present most economical system of sewage purification. In the discharge of this sewage there will be nothing floating—although it is dropped

into the river in the New York City system—and there will be no nuisance or offense, because the amount of suspended matter that is in this purified sewage and non-putrescent discharge, is no more than what comes down in the river, therefore not making the river worse than it is in any way.

Col. Knight: You say that matter is non-putrescent?

Mr. Hering: Non-putrescent—the modern system of sewage disposal,—if you care to hear it—

Col. Knight: I would like to know why, if it is organic, you say it is non-putrescent?

Mr. Hering: It is not altogether organic. The modern system, the cheapest system is, purely, aeration by means of spreading the sewage over a bed of stone, through which it percolates, goes around the surface of the stone, which is exposed. Now, if the stone bed is to be permanent, and not require cleaning, everything that goes in must come out; therefore, whatever solid matter goes in and forms, must go out; this is effected by means of a non-putrescent flush, and the resulting matter is called in England, humous; this, being introduced into a river, is likely to make it turbid. Of course, in the European or English rivers, the waters are more clear, and they settle this out, but in our Southern rivers, for instance, where the streams are all muddy, it would be — thoroughly settled that it would cause nothing worse than what is in the river. But it is the proper method of sewage disposal, and by its means you get your effluent absolutely non-putrescent. I believe thoroughly it can be done; it has been done in England, is done here at the present time in one system—but there are still a great many unknown quantities about this method, and we are not at all at the end of the book.

Mr. Kissam: Before this hearing closes, I would like to make a few remarks. I represent the City of Orange—

The Chairman: Mr. Hering has not concluded his remarks as yet; you will have an opportunity to speak.

Mr. Hering: I was asked, also, to give some data as to just what happens to the sewage, and how far it would travel up the river after it was discharged at Robbins Reef Light, and I have not been able to get the data to make all of those calculations, but what remains is pretty simple. If the sewage is discharged at Robbins Reef at low tide, then, when the tide comes in it will all travel up

stream, go up the Hudson River and the East River. Just how it is to be divided, I cannot say now, but, let us say it goes up the Hudson River to a certain point. I cannot tell you how far it is. It would be a little difficult question to answer that yet, unless experiments had been made to verify it. You know, of course—I will make that statement to your honorable Body,—water does not run up like the body of a wheel,—it runs up faster in the centre of the stream than it does at the sides, and faster at the surface than it does at the bottom, and, therefore, to make any prognostication as to just where that sewage would go, or how far it is going, is a matter that cannot be answered off-hand.

Mr. Lebkuecher: How long will it take to dilute the sewage so discharged?

Mr. Hering: I think it can be diluted so that you could not see it at all within perhaps—well, I make a guess now, based on rather long steady study and experience—a few thousand feet from the place where it is put in, I do not think you would be able to see it.

Mr. Lebkuecher: But in the experiments with the aniline dye water showed it went how far?

Mr. Hering: Well, we did not know how far it went because we did not see it at all; the aniline dye water we put into the water at thirty feet below, we never saw again, but as this was only a preliminary experiment, so to speak, we did not think—we were not prepared to make any further investigation, presuming it could be done at some future time to find out how it is going below. All we were interested in was how soon it would come to the surface.

Now in this proposed sewer, we propose to discharge at fifty feet below the surface, that is, on an average of about forty-five feet, and if it does not come to the surface at thirty feet it would probably not come to the surface if discharged at forty-five feet.

Now, I cannot say how far it is going, but the very fact that it moves up the centre—whereas all of the New York sewage is discharged at the sides,—the Jersey sewage being discharged at the centre would keep those two bodies of sewage somewhat separate, if they exist perceptibly, as I do not think they will by the time they get up to New York. I do not know how far the sewage would run up. I have not been able to look that up in the short time that I have had. Now, let us analyze, somewhat, this question: Some of the matter that goes in at the outfall will probably be coagulated, if it goes down deep into a saltier water than at the top, but that whole question is not by any means clear. I think it has been misrepresented often. I am sorry to say that I believe my friend, Dr. Soper, yesterday fell into an error in presenting two photographs here, of which I merely heard, but which say that sewage—but which would lead you to infer,—or might lead you to infer, that that sewage, discharged down here at this outfall, would deposit more in salt water than in fresh water.

I do not know how my friend, Dr. Soper, made those experiments, but that is not the way things are going to happen here. In the first place, we take out the suspended matter, by deposition. We

take out the screened matter that is not in that sewage that you get down there,—that is taken out, and the deposition,—that we do so is material as that is just we propose to take out,—that is not in the sewage that the Passaic Valley Commission proposes to discharge into New York harbor—that is taken out by screening and settling tanks, and, therefore, I do not think it is a fair inference to judge from a chemical experiment in a laboratory, what is going to happen there. We just must know what we are doing.

Now, I also want to say this: That, in Europe, where they are working pretty hard on these matters, I heard statements from prominent chemists—I am not a chemist myself and I do not wish to have you, sir, take any of my opinions on chemistry as final,—I heard that the experiments that had been made there on this subject of precipitation in salt water and fresh water under proper conditions, and proper water, showed that there was more precipitation in fresh water than in salt water,—against what I have heard here to-day stated. Now, no less an authority than Dr. Fowler, of Manchester, made that statement to me last summer, and I will say that, within a short time, perhaps a month or two, the Royal Commission of England, which has been working on this matter for I don't know how many years, it is years—made its report on the discharge of sewage into tidal estuaries. It is a large blue book about two inches thick and in it, I think, very nourishing reading,—it has a great deal of information in it, by the best engineers and chemists of England—Dr. Fowler is quoted in the report, as is Mr. Adney, and Mr. Leets, and other prominent engineers, representative people, and they got through with their report; I have not gone all through the book, but I am quite familiar with its contents, as I had consulted with a number of those gentlemen last Summer, and know about what the results are. I have read some of the conclusions they reached, and was much gratified to find that the Passaic Valley Sewerage Commission had, to some extent, anticipated the report in the recommendations which they had made.

Now, we cannot take this question as final at all, whether sewage is going to congregate we know, but just how much, is another question, there is still a good deal to be done. I anticipated, of course, that the Passaic Valley Sewerage Commission, in due time, would make the necessary experiments to find out all the principles necessary to make their work beyond criticism. Now, some matter, I said, would be coagulated. Some matter will be deposited on the beds. Now, what is that? That is chiefly, gentlemen, pretty near wholly, the street wash water that comes out in the combined sewers. Now, this has been shown in Europe very nicely in cities where they formerly had combined systems of sewers and discharged right into the rivers; they got their sediment, and afterwards they took the sewage out and purified it; they had the same black deposit; not so much, but it is that same character. Where does it come from? Why, it is the surface wash from the city. In New York it would be the street wash, the attrition, the dust that deposits a particle, it is that which does not

usually get into the sewer. That is all cut out except the decomposable matter there, those stable fibres continue a long time, decompose slowly. It is not like animal matter, which decomposes very rapidly. This organic matter, which remains a long time, those shreds and fibres, they go down.

Now, that deposit finally, when the velocity gets so light that they will drop, drops down, particularly when you get near the ocean,—the bar is formed practically of just such matters, and, where there is no such deposit, it is formed of suspended
248 matter that comes down the river from the fields and forests, and so on,—that forms the bar, so, only the suspended matter that remains in the sewers, and that is the deposit on the beds, and it is of that character nearly always. The other is consumed. It is eaten up, either by the gross animal life in the harbor, or it is eaten up by the bacteria which fill this water here, given the presence of oxygen; that is to say, the water must not be diluted so that there is not a sufficient amount of oxygen to nourish the bacteria which you need to eat that up, so that most of that matter is dispersed in that way. Some actually goes out to sea.

Now, there you have the whole list of matters and every one has some value. We did not know what—I could not give you any figure at all. One guess is as good as another, but that is a matter, a subject which I hope somebody who has money to spend will some day investigate and illuminate the scientific world on,—how those proportions really are.

There is another matter I have not mentioned: That is, grease. A good deal has been said about that. They said,—I think some gentlemen said, and I think, also in the paper, that we would be able to see a big black grease spot at Robbins Reef Light. It would be right in the line or route of boats to Staten Island, and would be very objectionable. Now, there is no doubt about it at all, that some grease will come down; some of it will be kept back in the settling basin no doubt, but a good deal of it will come down here without question, and grease rises to the top, being lighter than
249 fresh water. It will go faster than fresh water, but I think that matter has not been sufficiently tried anywhere to know exactly what it is going to do. My own personal opinion is that there is going to be a dispersion, and the appearance of grease in the harbor will be very slight. I do not think that you will see perhaps not one-fifth or not one-tenth more than the grease that now comes down on the surface from these New York sewers. Nobody complains of that. I do not think anybody will complain of the grease that will be caused from the Passaic Valley sewer. Besides, it is not offensive. You have all noticed, on the ocean channel, in perfectly still waters, you will see a great track where vessels have passed before. That very small amount of grease is spread out over a large area. So, to-day, when the water is still, you can see in New York harbor a great deal of grease now, but, as I say, it is not objectionable, it causes no odors, it is not offensive, but it is a feature that will be there just as it is to-day.

I wanted to say something which I think is apropos. Manchester

is a large city in England,—it is there, quite a little distance from the ocean. It got a ship canal from the ocean so as to have ships come direct to Manchester instead of trans-shipping goods at Liverpool. Liverpool is at the mouth of the Mersey, there is a large bay,—the tidal water fluctuates about twenty feet. Manchester is a manufacturing city, also; there is lots of trade there, and the sewage proposition is a very trying one, as it has been in most of the cities in England. A Commission was appointed; they recommended purification. Now, most of the engineers going to Europe have visited over at Manchester, the works are very large, but I do not think that any one feels that he would like to see a work of that kind in this country. I want to say, in defence of their efforts, that they did not have money enough to do all that they intended to do at the outset; because it is expensive; but, the interesting part to me is this: I knew —, —I won't mention his name,—I will say that he is a high authority in the same profession with me in Manchester. He said to me, in the year 1900, that "it was a great mistake that we did not build a big trunk sewer and go out to sea, to Liverpool, or down in the Mersey." "Liverpool is now discharging all of her sewage into the Mersey, and nobody knows where it goes. It is not visible." But he said to me: "Don't mention that to anybody; it might cause a lot of trouble" It is a personal opinion of his. I saw him again this Summer, and I reminded him of that. I said: "How do you think now?" He said: "Why, I am publicly advocating it; as the best method of disposing of the sewage of Manchester." Now, England is ahead in sewage purification work. It is a very nice thing in small ways, small towns,—it is a nice thing where you have large areas of sand like Berlin and Paris, and a terrible thing where you have not the sand or the areas. Because this was expensive, and you cannot generally get all the money you want to do things in England. It is a practical question.

This question must be divided into three: One is hygienic; the other is that of nuisance; the third is that of cost. The cost controls in most cases.

In this case, I do not think the cost controls or should control, because this Metropolitan District wants the best, whatever the cost will be, provided it is reasonable, and, while I believe that the sewage disposal of the Passaic Valley by purification will cost more, I am not prepared to say exactly how much more, and I am perfectly willing to say "Let it go at the same cost" because we do not know all these things so well that we can prognosticate exactly what it is going to cost now—while sometimes we are right in an estimate of cost, sometimes we are very far wrong,—so let me say it is the same cost, because I do not think it influences this matter at all, but the hygienic question and the nuisance question, now these two, it seems to me, must decide this. Now, the hygienic question, I see, is approaching a very satisfactory solution, although we are not prepared to give any facts, and are not prepared to build any works yet,—and it is to add something to the sewage which will destroy the pathological bacteria and other bacteria which cause disease. If we can do that, we have destroyed the cause of disease in sewage, and there

is nothing more to be said about that thing. We do not drink this water. That, really has no value in potable water,—and where you put sewage is not potable water, and I may say here, unless I am taking too much of your time, that I do not believe it is proper, in a civilized community, in the largest city of the Western hemisphere to raise oysters right here in the Bay even if we purify the sewage. I don't think the oysters fit to eat, with all the street wash of the City of New York going into the Bay, and which will deposit more than sewage deposits which is mostly oxydized through being exposed to the air; and, although, as I say, all the sewage of this district, New York City included, should be purified, I do not think that the oysters would be fit to eat on this account; therefore, I have never considered seriously the expressions on the oyster question here in this harbor, nor very much the fish question, for that matter.

Just one more thing. I will say that I am by no means of the opinion that you cannot purify sewage to-day. You can; we have done it; we are doing it today, and can do it very satisfactorily, and I can give you no better proof than this: Many years ago I was in Europe, as I am frequently, and I visited the Berlin farms and the Paris farms. I have seen them since, several times: I had my boy with me, eleven years old,—I drank the effluent from both those farms; so did my boy; he is now twenty-eight years old, strong and healthy. I never for a moment doubted that the sewage was purified, because I knew exactly what took place. We have now in this country, at Framingham, Massachusetts, a plant where the sewage is purified, the effluent is pure, but the operation of the work is not wholly satisfactory,—it is intermittent, and there is a nuisance discernible for a considerable radius, which no community in this Metropolitan District would sanction.

253 I believe, as an engineer, serving a community, that his recommendation should be that which is best for a reasonable sum of money, and which will, therefore, satisfy all demands.

About the nuisance question I have not quite finished. I think I spoke about that yesterday; that, in order to prevent nuisances, you simply have to have an isolation — sufficient isolation and dilution, and that removes the nuisance, so that if you can get that dilution, you prevent your nuisance. Now, gentlemen, I have heard it said, by some sanitarians: "You are all wrong when you talk about this dilution! You cannot dilute microbes: You want to get rid of them all. You don't want to put sewage into the sea water or into water with them in it, you want to get rid of them all before." If we could follow out the effluence when it leaves the sewer outfall, as we would like to,—and possibly with the aid of money, things will be different,—but I have viewed this question of dilution from a practical point-of-view,—not from theoretical point-of-view. It occurred to me: It is the same as this room. We are exhaling carbonic acid gas; we are exhaling, some of us, possibly, disease germs, yet we would not think of recommending some way of attaching a pipe to our mouths and purifying the air before it was discharged into the atmosphere. This air we are in has a certain capacity for removing certain refuse matter which takes care of this pollution to

an extent; we do not know quite how much, but we have
 254 found, in fact, that the air settles, becomes heavy, under circumstances such as these, with a large number of persons breathing in a more or less limited space, and we open a window, or a door, and ventilate; we know about how much air is wanted per hour, and in the same way we know how much water is necessary for the proper dilution of sewage; there, also, oxidation is taking place the same as in the air only a little slower, so that I have thought, as it was necessary to get more air, to purify the atmosphere of the room, by adding ventilation, you are solving that question. So that I have thought it was the United States way of solving this question; and the water of our towns should be utilized for street washing to a proper extent, and no further. It means taking a certain amount of filth from the city,—the surface washings; we could not purify this,—the question is, how much solid matter is left in our sewage after going through the screens. Let us ask ourselves reasonable questions like that, and then we get our opinions and information concretely.

I do not know whether I did say anything about it, but I find that most of the black muck found, of which we have heard so much about down here in the Bay, is mineral matter or organic matter slowly decomposable and which is the washings of the unbounded surfaces of this community,—there is very little of it from sewage, which has mostly been destroyed by oxidation or consumed by marine life, before it reaches the harbor.

Col. Knight: You stated yesterday something with respect
 255 to the amount of water with which the Chicago sewage should be diluted, and as I remember, you said something like three and one-third cubic feet of water per thousand of population, was that it? So much per second?

Mr. Hering: Yes, sir.

Col. Knight: Then that amount of lake water to each cubic foot of sewage: Now, what would be the proportion you would think necessary, between the different effect of salt water and fresh water, necessary here?

Mr. Hering: The Chicago dilution is now, when I saw it last, early this year, 2.65 (two and sixty-five one-hundredths) cubic feet per second per thousand persons who discharged sewage into it. So that, taking it roughly, that we require four cubic feet here,—I don't know why I fixed that figure just now, but it is almost double what it is in Chicago. I do not think it is necessary to have a greater volume than in Chicago, although it is salt water, but, conveniently, let us take four cubic feet,—the chief reason why, perhaps, I might give that figure was is that New York has polluted this water already to some extent, although perhaps in different currents, along different lines of water from what those are where the Passaic Valley Sewerage Commission proposes to have the sewer discharge. And then, too, perhaps, we might also say that the decomposition is slower in salt water than it is in fresh water; so that if we take four cubic feet of this bay water per thousand per second, for one million six hundred thousand persons, which is the population provided for,

we would have six million four hundred thousand cubic feet
 256 per second required to dilute the entire Passaic Valley sewage
 in the proportion of four cubic feet per second per thousand
 people, that is, six million, four hundred thousand cubic feet per
 second. Now, suppose the average velocity of the salt water at the
 worst time, that is, when the tides change, when the water seems to
 stand still—of course, it does not stand still for a moment, at least at
 certain parts of the harbor, but let us suppose the average velocity of
 three inches per second,—I want to say it does not stop that way, but,
 for argument, let us assume these three inches velocity per second,
 moving up or down,—(there is an under-run which continues after
 the tide has changed on top, and various conditions govern, differing
 for the water at various depths, and if you take the water altogether,
 in a vertical section, it is moving in the section somewhere). Now,
 take the average velocity at the worst time, of three inches per second,
 where there is the very slightest movement,—that is, we would re-
 quire a cross-section of twenty-five thousand six hundred square feet.
 Now, as the average depth of the shaft is going to be about forty-five
 feet or thereabouts, that is, we require a width of discharge area of
 seventy by five hundred and seventy feet (Now those are only just
 assumptions as I have made and are of course, rudimentary,—my
 original figures at the moment). Now, if the velocity is six inches
 per second, and I am pretty well convinced that that is nearer right
 than three inches per second, for a few thousand feet—or for half
 that distance of five hundred and seventy feet, or two hundred
 257 and eighty-five feet, which is the half of the width of the
 dispersion area, this sewage is to be dispersed then in a cur-
 rent two hundred and eighty-five feet wide and forty-five feet deep
 as it passes from those openings and takes this sewage from perhaps
 several hundred openings (And I don't know how you can compare
 a dispersion which takes place all over the bottom in this way, with
 that which follows at Boston from a discharge practically at the sur-
 face, out of a pipe which runs upward, while the dispersion here is
 horizontally and down the slope).—then you would have somewhat
 the conditions as in Chicago—you would not see it anywhere, in
 Chicago you do not,—I mean on the surface.

Col. Knight: You leave it to the Board—you refer to leaving it to
 the Board to determine the amount—the size of the sedimentation
 basin; do you mean,—shall we infer at all from that that you do
 not deem a sedimentation basin necessary yourself?

Mr. Hering: No; I certainly would recommend a sedimentation
 basin if for no other reason than this fact, that Newark and Pater-
 son have not the separate system and there will be a great deal of
 storm water and street wash going into the sewer from their com-
 bined system and that ought to be taken out. Now, after the sepa-
 rate system is built over the whole area, then, it seems to me, the ne-
 cessity for a settling basin would largely diminish, but I am really
 not prepared to say now as to what I should recommend under
 those circumstances, but I certainly would recommend one
 258 now because of the silt that Paterson and Newark would un-
 questionably bring into the sewer.

Col. Knight: But you are not prepared, at this stage, to pass upon any dimensions?

Mr. Hering: No, sir; they have not been computed. We never made any assumption.

The point I would like to have settled, if I had the opportunity, is what will be, what will have to be the size of the particles that will continue to float along up the moving water of the Bay without the tendency to deposit. Of course we all know that there is a fixed relation between the weight of the particle and the velocity of the water which will keep it in suspension. Now, if course the velocity gets less sometimes, then stops then goes the other way, and very probably most of the depositing takes place at the time of least velocity; therefore, it is very likely that this is a question of adjustment more than anything else; as to what size should we want, or permit, to go out into the bay, and, when that size is determined,—or the weight I should say perhaps, not size—then we can say—we will come to know to say it is not going to deposit, or we will have a deposit of so much, when we have the velocity fixed at so much per second, it is a matter of pure arithmetics to compute, and as to the design,—what would be most agreeable to the Commission would be for you to estimate the velocity of the water in that basin, because that would enable us to compute the size of the basin; because it is difficult now to say just what size of particles will

be permitted to go through so as not to occasion a deposit.

Col. Knight: Well, now, will not your screens take care of that instead of the settling basin?

Mr. Hering: No, sir; the screens take out the large floating matter.

Col. Knight: But you were speaking of screens of a millimeter opening; will large street refuse go through that?

Mr. Hering: No; well,—perhaps seventy-five per cent. might go through,—all of the very fine matter, and the most of it is the fine matter, will go through. These millimeter screens will only take out twenty-five per cent. at the most. Now, what is left? Seventy-five per cent. That goes through, and it is so fine that you must realize that it will float to a large extent,—and there is the difficulty about suggesting just exactly where you want to draw the line in that prime matter. Of course, coarse screens should be put up to keep out the coarse matter, that which would otherwise float on the top of the water and be objectionable in appearance, but the usual screens employed in the foreign sewers range from a half inch—from a half-centimeter to an inch,—and I would say that in my opinion anything less than five millimeters might cause trouble and should not keep out more sewage. And, it is a remarkable thing,—which we do not quite understand yet, unless you consider that seventy-five per cent. is very fine, in this proportion it is very fine particles of matter; of course, the chemists determine this by evaporation and other processes, and determine that this seventy-five per cent. does go out through the finest screens.

Col. Knight: But you do not say anything which helps towards

arriving at present at what should be the dimensions of the sedimentation chamber?

Mr. Hering: No, sir; not yet. I do not think we have any evidence on that subject. We have not tried to get it, because there has not been any money to do it.

Col. Knight: But you think, with money, it can be determined?

Mr. Hering: Yes, sir; I think a reasonable result can be determined.

Col. Knight: Then, would it not be a fair restriction on this permit, if issued, to require that that should be determined before the permit shall issue, being an essential part of the proposition?

Mr. Hering: I would not like to answer that question in the presence of the members of the Commission. That is a matter of judgment. I think that—as my personal opinion, as the opinion of an engineer—I would say that I should not have any hesitancy in fixing a certain amount, a certain size of settling basin, but I would admit that some might object to it, and have good grounds for so doing.

Col. Knight: You consider that it would depend on the velocity of the sewage as it passes through the basin as to how much is deposited there?

Mr. Hering: That is a very small matter—a very simple matter, to make the settling basin larger or smaller; this can be determined in easy fashion after the work commences, as the settling basin and its dimensions can be determined later, one of the latest things to be built; that is a question that perhaps might be solved after these works have been perhaps half or three-fourths constructed; I should say that it might take a long time to settle that question to everybody's satisfaction; but I personally should not hesitate to go ahead and build it, and I would build it, and I would think I was doing my duty because I would believe in my work,—the results of all I have seen in Europe would go into the work, and we make those points the subject of enormous study, the most constructive points that there are I have usually tried to see. It is merely and simply a matter of judgment, not calculation or scientific certainty.

Col. Knight: But there are in certain sewage systems—you were speaking of the character of sewage at Hamburg: Do they use screens and sedimentation basins there?

Mr. Hering: They use a sedimentation basin which, if I remember rightly, is about the size of this room, and screens one inch apart—

Col. Knight: But they do use sedimentation basins?

Mr. Hering: Yes, sir; to that extent, and, let me say this,—that it is only for very large matter; the velocity of the water going through that sedimentation basin is doubtless a meter a second,—between three and four feet a second; now you are not going to get any very fine deposit at that velocity,—only very large matter drops down there. By screening, the large floating matter is prevented from going out,—by sedimentation—

Col. Knight: All the sediment is screened—

Mr. Hering: The screens are located over the sedimentation basin—

Col. Knight: And it is only the matter that is caught by the screens that goes into the sedimentation chamber?

Mr. Hering: All of the floating matter is caught by the screens—

Col. Knight: But all this matter that drops as a result of the passage through the sedimentation basin would be caught on the screens?

Mr. Hering: Possibly it would; only it is far better to have it separated, so that it can be dredged out properly. At Hamburg the screens move, and whatever of the soft floating matter lodges against the screens is removed; the screen is lifted up and travels along and is then scraped off at the output into a moving trough, and that moving trough is emptied—it empties this stuff into a canal boat lying constantly alongside, then taken away; there is supposed to be a canal boat alongside all of the time. But let us suppose that a stone or a log is going through the flow into this screen chamber, you could not pick that up on the screen; therefore, there is a sedimentation basin there to hold that.

263 We have a dredge running there—opposite the works—

Col. Knight: Then there is a deposit as a result of this sewage outfall at Hamburg?

Mr. Hering: There is a channel there,—the big Hamburg-American line boats pass right over the outlet; whether the dredging is made necessary entirely by this outfall it remains to be seen; the fact is that there is a dredge running there practically all of the time, but the system of dispersion there differs entirely and is governed by different conditions of current and dilution.

Mr. Kissam: Mr. Hering, do you think there would be enough water at a point in Newark Bay, say, near the Bergen Point Light, approximately near where the Arthur Kill and the Kill van Kull and Newark Bay join,—do you think there would be enough water—water sufficient to cause the necessary oxygenation of sewage discharged in or about that point, provided the sewerage was screened and sedimented about as proposed?

Mr. Hering: That has been recommended to me, but was not considered by me.

Mr. Kissam: Well, what is the objection to it?

Mr. Hering: There is no other objection to it than that it is only a question of time when we would have to bring it out to the Bay—a question of time when we would have to bring that up. Now, in this proposition, just what composition is discharged into the middle of the Bay is significant, and is as recommended, but there you can get a discharge at the bottom of the Bay, and I think you cannot get a discharge into the bottom of the Narrows, but I think the dilution would be sufficient to render it in-occuous, at the points referred to.

Mr. Kissam: And that still remains true after twenty-five years?

Mr. Hering: No.

Mr. Kissam: Well, how long, in your judgment, would it remain?

Mr. Hering: That is very difficult; I have in my office——

Mr. Kissam: Well, how long do you think?

Mr. Hering: I have calculations on that subject. I know it has been gone through——

Mr. Kissam: You did consider it?

Mr. Hering: Yes, sir; it is only a question of a few years, and then you will have to go somewhere else, which necessarily involves the loss of money and time. I would like to say, in passing, if you will permit me, that the future of these matters is a factor that should never be lost sight of by an engineer advising the investment of many millions of dollars. I do not think that this sewer is the end of things. There is going to come a time when something else will have to be done with that sewage just as with the New York sewage. Where can you do anything in this great Metropolitan District? There is only one place, and that is below the Narrows somewhere.

Mr. Kissam: Well, is not the alternative remedy the sprinkler system you suggested——

265 Mr. Hering: I am not prepared to say what should be done with the New York sewage——

Mr. Kissam: I mean the City of Newark——

Mr. Hering: The alternate is a sprinkler system; yes, sir.

Mr. Kissam: That would be entirely feasible?

Mr. Hering: Yes, sir; from an engineering point of view.

Mr. Kissam: What would be the objection to that?

Mr. Hering: The objection would be this, in my opinion,—not as an engineer. You have to have a considerable area around this plant to protect the outside from the odors coming from it, because the sprinkler system causes considerable odor. Now, I am not so certain but the time will come when we will house some of the sprinkling filters; we have housed some of large dimensions that way. You will have to have about one hundred acres for this sprinkler-filter,—something like that. You want to have plenty of land around it, to prevent the odor from becoming offensive, and I think that half the section lying below the Hackensack, or something, I forgot the name, would have to be devoted to it. Well, now, that part of Newark and Hackensack Meadows is, I believe, going to be built up and populated as soon as some method has been found to fill it or to drain it and get it ready to produce something and return some revenue for its position—it has a very very attractive position for many purposes, right between Newark and New

266 York, and this sewage disposal system would be a detriment to the development of that whole area, and is so considered in

Europe. It is not a place where you go with preference,—you go away from them with preference, although I admit that there are places along these sewage disposal grounds where people live, but you find them nearly always alone, in intermediate districts where there are no conveyances, or practically none, and I do not know of any of these larger processes for purifying sewage where people live up close.

Mr. Kissam: Have you considered the Newark Meadows at or near Elizabeth?

Mr. Hering: That is just where—that is the locality I was referring to—

Mr. Kissam: You said Newark—

Mr. Hering: Well, that is just where such a plant would have to be located—

Mr. Kissam: Have you gone over that territory?

Mr. Hering: Yes, sir.

Mr. Kissam: It has no buildings? Is barren land?

Mr. Hering: Yes, sir.

Mr. Kissam: It is an absolutely barren territory, is it not?

Mr. Hering: Yes, sir.

Mr. Kissam: Ranging for miles from the Bayonne peninsula, off for several miles?

Mr. Hering: Yes, sir.

267 Mr. Kissam: Now, the point I wish to make is this: I represent the City of Orange, and, of course, the element of expense is very important to us; the cost of that deep tunnel sewer will be about twelve millions of dollars, and the cost to us will be about six million dollars, or about one-half of the whole estimated cost of the entire project. Now, the point I make is that there is no necessity for the granting of this application, because it is entirely feasible to put in a sprinkler system on the Newark Meadows which can entirely take care of this situation, the only objection to that, is the odor, and the possibility of being a detriment to the building up of those meadows in the future.

Now, we do not, in the City of Orange, object to improvements; we stand prepared to do everything we can to clear the Passaic and make the Passaic River a beautiful stream, once more, but we do not want to be put in the position that where these Commissioners have wasted a large amount of our money, to be compelled in the course of a year's time or in the course of a few years, in the course of a generation, or fifteen or twenty years, to pay this thing all over again, because then it would be necessary to establish a sprinkler system because of the condition of New York harbor. If New York harbor is to become so vile, in the course of a reasonable time, that it will cause disease, be offensive, become filled up, and the people will have to stop sewage into New York harbor, it seems to me very unfair to us to tap the

268 smaller towns to a point where it means almost absolute penury in order to experiment with this sewerage disposition system into deep water, which is entirely unnecessary.—I mean when they admit that the sprinkler system is entirely feasible. The point I make is that it is not necessary because it is possible to dispose of all this question by erecting the sprinkler plant.

Dr. Brush: The hour is late, and I do not wish to detain you, but, speaking for the Brooklyn League, which is composed of over a thousand of our business and professional gentlemen of Brooklyn, I appear to oppose this proposition for the reason that the added pollution of this proposed sewer to the waters of this Bay will simply add to the difficulties which have now been demonstrated by the examina-

tions of the Merchants' Association which, I suppose, are before you,—if they are not they will be, in a pamphlet which shows that pollution by sewage in the waters of New York Bay, and while the waters are not potable or drinkable as with Boston, at the same time there are matters deposited that are along the surface, and that is a question that has not been spoken of at all here to-day, or at all so far as I know—I unfortunately could not stay yesterday and lost a good deal of that which has been said, and if it has not been said, I want to say it,—we know that they have demonstrated that the intestinal diseases during the period of floods are very largely increased in the localities where this deposit is upon the posts and piers of the wharves of this City, and they have traced it to this: flies alighting upon the posts and then upon other materials and thence taken into the stomachs of children and adults as well.

Now, we protest against the pollution of the waters of this Bay any further, with any other materials that has not the bacteria destroyed,—any pollution, and it seems to me that in view of what science has revealed to us in the twentieth century, in view of that, it would be a shame and a disgrace to empty into the waters of New York Bay six hundred thousand gallons or six thousand gallons in which the bacteria of typhoid germs, germs of tuberculosis and all of the forms of disease that we know are infectious and perhaps contagious and especially infectious are contained.

And that is the ground upon which we base our opposition. It is on humanitarian grounds; it is not a question of taste and sentiment; it is not a question of smell; it is not a question of what we can see. Our worst enemies you cannot smell or see; those germs are hidden, and they attack us in points where we least expect it, and, therefore, I say that we should not consider for a moment the granting of a request which will enable any one whether in New York State or in the State of New Jersey, to pour more pollution into the waters of this Bay. We are trying now, and have been trying for the last year or two to get legislation at Albany which will prevent any further emptying of sewage into the waters of this Bay, and we are studying that question with a view to trying to get disposal plants which will obviate the necessity for that, which will make it necessary for the City of New York in the future to entirely re-construct or re-arrange her sewage system—and it certainly ought to be done in the interests of all; and, therefore, I am here to say that we oppose the granting of this permit.

The Chairman: The hour of half-past one having arrived, a recess will be taken until two o'clock.

(After Recess.)

The Chairman: Gentlemen, if you will come to order, this hearing will be resumed. The Board is prepared to hear anything further on the subject.

Mr. Harrison: There has been a considerable discussion here, and a number of statements made that may lead the Board to believe that the proper thing to be done in this Metropolitan District is to

undertake the construction of a sewage disposal plant. That would mean, I presume, in the opinion of the gentlemen making this statement, of the whole Metropolitan District in and about the City of New York; that we were to commence to establish a plant to take care of all this sewage in a sewage disposal plant, and, when I say the whole Metropolitan District, I would mean the whole five or six million people who now drain into the harbor of New York. That statement is a most extreme one. I know there are engineers in the profession who believe that all sewage should be passed through treatment and the effluence should be more or less pure. Some even go as far as to say that the effluent should be fixed so that it could be used as drinking water,—and they are very like some doctors. I know doctors who say that the proper thing to do with a child is to remove his appendix, that it is a bad thing to have and it is better to have it removed at once, rather than after it may have caused trouble later on in life.

The way the great conservative body of engineers who have studied the sewage question think, and I am one of those, and I think the great body of conservative men look at it, and I believe the officials of the City of New York look at it, is this way: that the way of New York, the Hudson river, and the great balance of the topographical features of this Community, this territory here, the East River, and so on, where the large amount of tidal inflow through it and the periodically large, enormous flow down the river means the best relief for the City of New York and for this community. Now I wonder if it is realized that in order to provide a sewage disposal plant and the necessary modifications in sewers, etc., it would require a capitalization of two hundred and fifty million dollars, to complete it, for the City of New York alone, would require the investment of two hundred and fifty million dollars. The gentlemen here representing the different boards here, and representing the different parts of the City of New York can represent whether the City of New York is prepared for some years to go into this thing, from a financial standpoint, and, when you do this, you cut yourselves loose from the natural advantages which have been yours and would be yours for all time. We think that it is proved by the evidence submitted to the Governor, and to the City of New York by the Pollution Commission, and also can be proved by their statements that at the present time the great body of water in the harbor of New York—of which we claim to be a part—which we are—we claim to be a part of it,—of this Metropolitan District naturally draining into the harbor,—that the great body of water in the harbor of New York is practically unpolluted. When I say unpolluted, I mean it is not fit for drinking water,—it is not potable, but I mean that the quality of the water is practically standard,—of the standard accepted all over the world for great commercial harbors,—practically unpolluted.

I do not think that any of this Board, gentlemen, can find any harbor in the world—with a community as large as this draining into it, with water that is as pure, as clean, as the water of the harbor

of New York. You won't find it in London, Rotterdam, Amsterdam, Genoa, Venice, or any of the great commercial cities.

Now, generally, I believe that all of these cases should be treated by themselves,—these cases of sewage disposal. We believe that inland developments, such as the city of Columbus, Ohio, and a number of Pennsylvania towns, and inland towns and localities in general, where the surface sewage has to be gotten rid of by some means so that the water is not carried into a stream thereafter to be used for drinking purposes,—that some method should be taken to treat it. But, we believe that the system—that where a community has a great purifying element right at its doors, that

273 natural right of having a large body of water, capable of diluting the sewage of a community and rendering it innocuous, have the right to use a proper, economical method of sewage disposal, and I think that is the idea of all engineers who are not specialists in some peculiar line.

Now, there is no doubt in the minds of this Commission, nor in the minds of any of those engineers who have studied this subject, that the harbor of New York, with the water we have got here, will take care of the needs of from twenty upwards millions more people,—of the sewage of those people, more than at present drain into it, and the New York Bay Pollution Commission nor anybody else ever said anything to the contrary. They all agree that at some indeterminate time ahead New York will reach a point where you will have to look out for the harbor, but that time will not come until the population draining into the harbor will have reached at least twenty million, and, of course, when I say that it will care for the sewage of twenty million, I mean if it is properly distributed so that the sewage is not locked up in estuaries and stacked up in the slips and piers, but goes into the harbor freely distributed. And this same condition of affairs has been considered.

Take the Boston case, which we hope to improve upon: In Boston, the sewage comes out of the sewers at the end of a pipe, a large pipe, in one mass. Now, the rapidity with which that sewage is oxidized, and the offensive characteristics taken care of, depends upon

274 the quickness of dispersal, as the air cannot reach the solid column of sewage discharging at the single outlet; that condition is one which we propose to change practically by means of our plans for dispersion of the sewage at the outfall. The same as when you put a lump of sugar into water; the lump dissolves slowly, and remains in the water a considerable time, but if you put the same quantity of sugar in the form of powdered sugar, into the water, it is gone quickly. That is our principle for our work.

Now, we come to the disposal works. As I say, where things are such that it is impossible to get an outlet, those towns labor under that disadvantage: Why should they wish to put this great community to that disadvantage, when they have the water here, and there is no question about it, nobody claims or has ever complained of the existence of a nuisance in the waters of New York; and these gentlemen have often, no doubt, noticed the presence of a nuisance

alongside the ferry slips, at low water,—which I have seen at Courtlandt Street, and at 34th Street, and at 42nd Street, and, especially there alongside the gas houses; we all know that Newtown Creek is another Passaic; and it is no wonder, with the sewer system in vogue; that is the point we want to reach—this sewage should not be brought into the pierheads, but should be so discharged into the tidal waters as to mix it and disperse it with the enormous quantity of water we have got here. In Boston they have done it, and we improve, in our proposition, upon the Boston methods, and I do not understand at the Boston works that they propose to give it up.

75 Here we have the State of Massachusetts, which has made more advancement in the methods of sewage disposal work than any in the world—in this country at least, and they have gone into extensive experiments above all others, and yet they adopted this plan of general ocean disposal,—they are extending that plan,—not thinking of giving it up.

You have the City of Baltimore with a disposal plant. Why? Because the lifeblood of the City of Baltimore was in Chesapeake Bay and the oyster beds and fields; they believed, and they were afraid that if they disposed of sewage in the Chesapeake Bay, and there should be a general knowledge of it, possibly that business would be ruined. That don't apply here. The gentleman talked about the oyster fields on the Jersey shore; well, I have lived around in this community, on the Jersey shores, for forty years, and we have cultivated other things than oysters on the Jersey shores.

Another of the points I have to speak about. I do not know, and I do not believe anybody knows of a sewage disposal plant anywhere that is absolutely satisfactory. We have gone into it quite extensively in New Jersey in some of the suburban towns. We started rather early in it. The town of East Orange started in over twenty years ago, and the engineer who put in that plant for East Orange wrote a very able paper on the subject after it was finished, and it was quoted as a very lucid statement of the case, giving a

very great deal of enlightenment on the subject of sewage disposal, and it was generally believed to be a successful plant. Recently, in conversation with a resident of that city, he said they were going to give it up; that he has not seen it in years—

Mr. Child: It has been abandoned.

Mr. Harrison: So there, you may believe, they have very little faith in sewage disposal plants of whatever kind. This is particularly true with regard to the system of disposal that was adopted for the town of Summit. I lived in Summit for two or three Summers, while the plant was working, and whenever the wind was in the right direction, the whole of Summit knew that they had a sewage disposal plant, and whenever the wind was in the other direction, the neighboring towns had the same knowledge forced on them. I am consulting engineer to the East Jersey Water Company, the corporation which supplies Jersey City with water, and I know that several times we have had to notify Summit that—

although their plant was twenty-five miles up the river,—the raw sewage was coming down to the pump works at our plant.

I had occasion, not long ago, to look into the plant at Richfield, and there they have a plant on a gigantic scale, complete in all respects, a plant built by engineers who stand pretty high in State of New Jersey and the City of New York, and at this plant they had put in contact beds and septic tanks, and then ran the effluent into a creek through a concrete channel, and if you will go up there to-day you will find the channel all cut up, the chan-
 277 nel stone piled up on one side, and the raw sewage running through on one side into the creek; the concrete beds did not work as they should.

I heard a little while ago, when I looked into the broad irrigation plants of Westfield, the water worked its way over a portion of Westfield, and to take care of that they went over where there was more territory; that plant, as you will admit, is a well-built plant, but that plant should be at the effluence, which we would have no objection to, putting the effluent into reservoirs, it was found that the effluence did contain an odor, which might have been anticipated, but we did not expect to find at a distance of two and a half miles from the effluence, actual effluent from that sewage plant discharging into the Rahway river at tide water.

Now, there are also several plants at institutions, I should say,—at Morris Plains, at the Normal School, and at small institutions; there you probably have a million gallons or less than a million gallons; those plants work; that is, they do very well, but when you come to figure up the cost,—they are all in the hands of skilled men, who take care of the institutions, stay there, live there on the place, and always watch carefully about the cost, yet the cost per million is prohibitory, when you have several million gallons a day, the cost becomes practically prohibitory, and when I say prohibitory, I mean reasonably prohibitory. It may cost the City of New York
 278 a great deal to take care of its sewage under such a system, but that would not mean so much to so thickly populated a community, the same being true of Newark, but when you get up into the State, to the towns and cities right up on the Delaware, where they have to use the water for drinking purposes, and must dispose of the sewage, many of them cannot afford to go to that expense.

Moreover, abroad, you find disposal plants all over England, and I have never been near one yet, never been around one of those disposal plants in Summer but what you can tell there is a disposal plant there. Those plants always send up that sweetish-sour smell of sewage, at all times during the Summer. And we get knowledge of them the same way in the continental plants. The gentleman who spoke of the Berlin plant the other day said that it does not smell there; that may be the case, but it is a fact that nobody lives there.

Then, another thing, the effluents from these plants are not what these gentlemen think they are. They are not fit to drink. They simply look pure, and are very apt to contain a portion of the sew-

age, and do as a usual thing, they are entirely clear, it is true, but not fit to drink.

One thing you want to remember, and a very important point in this case, I think, and which I forgot to mention here in my discussion yesterday, and it is, when you take the sewage out of the Passaic River and out of Newark Bay that will give you about one-eighth of the flow of the Bay—the flow of the Narrows, in 279 pure water. At the present time the waters of Newark Bay and the Passaic River are almost totally devoid of oxygen, and have not any in Summer, but when we take those waters running through the Narrows into Newark Bay, you abstract a portion of the oxygen which is in the Bay; but when we take the sewage out, you will have one-eighth of the ebb flow,—the flow of the Hackensack is about one-eighth of the Narrows flow, you will find one-eighth of the Narrows flow coming in there with practically pure water, with plenty of oxygen in it, ready to help to reinforce the oxygen of New York Bay and thus oxydizing the sewage as it goes into the Bay.

Now, I think, and our point is that though at first blush it seems to be quite a proposition to ask permission to do what we are asking to do, yet, any New Yorker, who thinks over the subject and comes to understand it, will ask himself why they should be at present opposed to this plant? We will take the sewage out of the Bay, and clean it for you, and in doing that, we are taking from New York a right worth two or three hundred million dollars, and now it may be said that when the population of New York or of this Metropolitan District draining into the Bay shall reach twenty millions in all this section, you will have to take care of it, but what engineer here will be fool enough to say what methods there will be for the disposal of sewage at the time when the population of this section reaches twenty millions. We may be turning sewage into whiskey or alcohol then.

280 Another thing, how do we know that there will be a population of twenty million in one congested mass? If this is to be a city of twenty million population, just try to imagine what the effect will be of four times the population in the crowded streets of New York; how would you supply them with food, where would you get the railroads to serve them? All of these things must be considered. So, it is doubtful, a very doubtful thing, and no one credits this opinion as to what New York is going to be in twenty years. We all know, and you gentlemen know, that in 1866, a gentleman then at the head of your Health Department, wrote a report in which he said that New York harbor was filling up, and he asked that a report be made after a survey of the conditions; and the result of that report was—the gentleman believed it was filling with sewage,—he thought that sewage was having a great deal to do with it, but the fact was that the report showed that a number of individual contractors who were dredging in the harbor, who dredged around New York, were dumping their dredgings on the Jersey flats; they dumped it on the Flats without any bulkheads; that dredging was running down towards the channel, and a survey was made which showed along the Jersey Flats dark lines sixteen to twenty-

five feet below high water at the large channel, for about two hundred feet, and of course in the Flats it don't take very much filling to bring in two hundred feet. Then there was a great time made about it, everybody said that the harbor was filling up, particularly this Health Commissioner, and he said they would not be able to

281 get the Great Eastern in,—the "Great Eastern" was the big boat of those days. The report was made out and a regulation

made, which is that regulation which applies to-day, that no more filling should be put in except inside of bulkheads; the regulation being enforced, there was a large improvement as after that all this filling was stopped. Now, this brings us to the question of deposit. I have a very intimate connection with the bottom of New York Bay, especially on the Jersey side. I made the first investigation for the present Pennsylvania improvement,—the borings and soundings. I have made very numerous investigations since then for railroads with regard to terminal facilities; I am very familiar with the depths of water, and have been familiar for the last thirty years, during the time that New York has been growing from a population of five hundred thousand to four million and up, and am acquainted with the theories of this flowing mud and its deposit, having made soundings and done general contracting work on the Jersey shores, and I do not think that there is any change in the amount of deposit, one way or another. If you will examine the Coast Survey Report of 1865 and their charts, you will find that to be so except where artificially filled in. Whenever I have had occasion to examine the bottom, this has been my experience, and on an occasion where I examined I found the river four feet deeper, that is, from Jones street North, from our dock, North. I believe the channel is about that much deeper, or more. Of course, that would be natural as a result of bringing in the bulkhead lines.

282 I have consulted with engineers on this point, and they are agreed. I do not believe, with the sewerage in New York Bay, you can change the arrangement of the Hudson River or New York Bay by the deposit of sewage; the river will take care of this. I also took this point into consideration: That the enormous flow of the torrent of the Hudson in the Spring, as you and I have seen it running ebb away down below the Central Railroad Bridge, running full of silt and mud and muck the result of the Winter's accumulation in the ice-bound waters from the whole of New York, which makes a deposit when it goes out beyond the Bay, after being brought down through the gorge of the river, and this may likely leave a deposit in a manner practically as it flows, just as has been going on in that locality for many years.

Now I understand what has been said—and I do not want to let it be understood that the engineers of this Commission do not deprecate the conditions of artificial disposition of sewage, as to conclusions from cost or taste. One of the most important factors entering into this matter is as to the business side, the side of commerce, the economical, proper sanitary welfare of the public and, taking everything into consideration the engineers of this Commission have concluded that the proposition involving the least risk, is the allowing of that sewage to pass into the water, under the conditions outlined. Now,

there is one point,—they seem to have an idea here that we are relying entirely on currents. Now, we do not. If you put one
283 part of sewage into fifty parts of ordinarily clear and pure water, water with the natural amount of oxygen in it, whether salt or fresh water, and fresh sewage, the sewage so put in is innocuous, in salt water in a tank, in sea water, or in anything else. That point is of importance to us; of necessity,—the currents of usefulness,—the presence of the currents is advantageous as it involves the presence of a large body of fresh water and of clean water, and we can arrange our sewage for passing through it. As Mr. Hering told you it is our purpose to have the sewage go out slowly; we can regulate it as it goes through our works. Boston cannot. Boston sends it out by gravity alone, without control. With us, in our system, it is only a matter of a little more coal to get a greater head on, or a little less coal and a slower head. That is arranged by the pumps. We let it go out as we want it to go, and we mix it or carry it in the diluting water. Now, when you get one part of that sewage into fifty parts of New York water, it don't go five hundred feet away before it is imperceptible, totally passed out of sight and dispersed.

In all the investigations made by Great Britain of the sludge from the London sewers as deposited in the River Thames; they take their sludge in large boatloads, take it down the estuary of the Thames to tide—deep water; when it is down twenty miles, they again throw it overboard, steam around in the same place, opening gates in the lower part of the boat, and allow the sludge to drop out. In ten to fifteen
284 minutes, or in a very short time after that sludge is dropped it is impossible to detect that any sludge has been

put into the water, so far as the closest bacteriological and chemical tests can determine; it is gone. They steam around; maybe let the boat go down the river and special tests show that it has been taken up by the oxygen in the water, by the bacteria,—taken up by the small animalculæ around there; and there are a great many around there, it is a great place for fishing, any number of people always fishing around in that locality. That is what we think is the case here with our proposition in New York Bay, and we think that will last until fifteen or twenty million people populate this district, and then, by that time, the engineers, I think will take care of it, and it is ridiculous folly for the engineers of today to say what they are going to do with New York sewage twenty years from now. You might as well have asked the engineers the plans of the Hudson tunnel thirty years ago; they never would have been able to build it according to those plans,—and in fact they could not do it with the plans then made for that tunnel; and when I talk about plans of thirty years ago, for that work, I am talking from experience, as I have been closely connected with the railroads and with terminal matters of the Pennsylvania Railroad, and with the terminal affairs of other railroads, for the last thirty years, and when I first took those matters up, we thought that it was foolish to undertake to build the tunnel, we thought that there would never be a time when the needs of the country would require it; nobody ever thought of

dredging to a depth of thirty feet in the lower Bay, and
285 equally unthought of was the building of such a structure
as the Pennsylvania Railroad is building today, and which is
absolutely necessary for terminal facilities. I then made a report
on the subject, and when it was put in, was practically concurred in
by all of the Pennsylvania Railroad engineers; it was folly, we
thought, to think that they would ever have such a railroad ter-
minal. Then, I may say, in those days in considering dredging
matters, we figured on forty or fifty cents a yard for dredging, and
as high as Two dollars a cubic yard for filling; and now, with the
improvements in mechanism for this work you know how the meth-
ods and costs have been modified: We dredge now for ten cents a
cubic yard, and we get all the fill in we want for twenty cents
a cubic yard; so that work which would then have cost upwards of
twenty thousand dollars is now easily done for Five thousand dol-
lars.

And, so I say, when these gentlemen talk about the waters of the
harbor becoming a nuisance, or becoming clogged up, if we will
measure the waters of New York Bay in the light of this big project
that has been undertaken by the Pennsylvania Railroad, with refer-
ence to what was thought would be the case, and if we look at this
matter on a large, broad scale, there is no reason why the great
advantages of New York should be, or be attempted to be, changed
from what we have learned they are, and it would really be a great
mistake in a great community like this, where the first question
is: Can you dispose of sewage by mixing it with water? Can you
arrange its dispersion so as not to create a nuisance? and,

286 secondly, If you can, don't think of anything else.

Dr. Soper: Representing the Metropolitan Sewerage Com-
mission, I read a statement yesterday in which the opinion of the
Metropolitan Sewerage Commission was expressed, opposed to the
Passaic Valley project.

After listening to all of the statements that have been made since
then, I do not think that I should want to change the wording of
that statement. It represents, of course, not my own views, but
those of the five members of the Metropolitan Commission, all of
whom have given this subject considerable study.

At the same time, in the proceedings which followed my remarks,
my name has been mentioned several times, and some of the state-
ments that I made have been criticized. For one thing, the name
of Mr. Allen Hazen has been brought into this discussion as having
contributed to the discussion of a paper which I read before the
Sanitary reception of the Boston Society of Civil Engineers.

I should like to have Mr. Hazen's complete discussion before you,
and, if possible, the discussions of Mr. Harry Clark, Chemist of the
Massachusetts State Board of Health, and Mr. Coney, the Engineer
of the Massachusetts State Board of Health. Mr. Hazen's remarks,
if I remember them—I have not seen the discussion of the paper
now for some time, referred to the inadequacy of the data upon
which he based his discussion, and recommended that the studies

287 which were being discussed be made very much more full and complete; those studies are now being made much more full and complete. The Metropolitan Commission exists for that purpose.

Mr. Harry Clark's discussion, if I remember it correctly, shows the danger of polluting tidal estuaries in the direction of injuring the purity of oysters and shell-fish. That point has been referred to here, in these statements that have been made before your Board.

Briefly: It may be unnecessary for me to extend them. It has not been brought out, however, that, within the limits of New York City, there are annually produced upwards of five hundred thousand bushels of oysters. They are marketed here and are eaten, for the most part, without cooking. Cases of typhoid fever have been accounted for, just as reliably, I think, as typhoid can well be traced, to the eating of some of those oysters; oysters cultivated and grown in the waters of New York. According to the latest statistics that I have been able to collect, there are grown annually about seventy thousand bushels (?) seven (?) * thousand bushels of oysters in upper New York Bay. This used to be a famous oyster-producing ground.

Mr. Hazen's discussion of my paper before the Boston Society of Civil Engineers, in common with the opinions of many other engineers with respect to the diluting-power of the waters of New York harbor for sewage, were based upon the assumption that all of the water of the harbor was available for diluting and assimilating the sewage, and, apparently, upon the assumption that that
288 water was immediately available for diluting and assimilating the sewage.

It has been demonstrated, and fragments of the evidence have been put before your Board, that sewage discharged into the waters of New York harbor does not immediately become dispersed. It has been stated that the sewage floats about upon the surface to a very considerable extent. We should, then, consider, not the tidal volume of water,—not the total volume of water which lies there in the basin of the harbor and floats in and out,—the quantity which floats in and out with the tide when the tidal prism does, as available water for diluting and assimilating sewage, but its surface area, multiplied by the certain depth—the exact depth we do not know as yet—which is all of that volume of water so available.

One of the most difficult problems which we are studying to-day in the Metropolitan Sewerage Commission, is how sewage discharged into these waters can be so dispersed as to become inoffensive before it is distributed.

With regard to this matter I would invite the consideration of your Board to a report of the State Board of Health of Massachusetts upon the discharge of sewage into Boston harbor, dated 1900. You will find there evidence in the form of an official report, and a map, to which I would especially invite your attention—considerable evidence upon the effects of the outfalls of the Boston drainage, and

*(Stenographer: Probably seven.)

modern drainage system—also some facts, one of which I will briefly read:

289 (Reading.)

"At the outlet in our Deer Island Beacon, which is four and two-thirds miles from Long Wharf in Boston, in the windfall East of the main ship channel, sewage from the North Metropolitan District is allowed to discharge as it comes, in all stages of the tide. The quantity of sewage discharged in twenty-four hours now reaches about fifty million gallons, and this quantity, while distinctly visible along the Northerly edge of the channel for a half mile towards the City, on the incoming tide, and towards the sea, on the outgoing tide, gradually becomes less distinct at greater distances from the outlet, and disappears entirely within a distance of one and a quarter miles."

The material is distinctly visible and described as "offensive" in this report; such material it is as would not be retained by screens nor by settling basins; it is material which floats upon the surface.

That is a sample or type of the local nuisances which exist to some extent in New York harbor to-day, and which we believe would very probably result from the discharge of the Passaic Valley sewerage under the plans proposed.

With regard to the exhibit of bottled experiments that I offered you—Mr. Hering brought up the question whether solid matters did deposit more rapidly in sea water or fresh water. I offered that exhibit to show you, in a graphic way that sewage sludged or deposited more rapidly in sea water than in fresh water. The experiment may be easily repeated by any one; it was done
290 in this way: Sewage sludge was taken, in equal quantities, and put into each of two bottles; one bottle was then filled with sea water and the other with fresh land water; the bottles were allowed to stand; at the end of the periods of time indicated on the photograph cards the effects, which can be noted, were photographed.

Mr. Hering has indicated that Mr. Fowler, connected—Dr. Fowler, connected with the Manchester Sewage Disposal Works, has, I think, an opposite view. I would refer your Board, for substantiation of what I was saying, to an appendix,—appendix number eleven, of the report of Mr. John Sylvester Freeman to the Committee on the Charles River Dam, Boston, 1903: I can briefly say that there are photographs reproduced there which illustrate, and in more exhaustive manner, and with various changes, what my photographs showed you yesterday, and I would ask permission to read this brief statement, from page 286:

"In the course of this investigation, and in connection with observations of the appearance of the river at present during times of storm, certain experiments have been made upon the comparative degree of rapidity with which bodies of turbid fresh water and turbid salt water clear themselves. It has been shown very clearly that salt water acts like a precipitant, especially if the turbidity is caused to some extent by bodies such as are present in sewage * * *

This is true if the matter causing turbidity is well mixed with the water. * * * If turbid fresh water is placed above salt water, the turbidity will disappear slowly when the water is quiet.

291 This effect is shown by the photographs;" and so on.

Those are documents which are well worth very full consideration.

With respect to the kind of turbidity produced by my experiments, and with these (indicating book previously quoted from), I would ask you to consider that the solid matters are not such as would be removed by screening, nor by simple sedimentation for the brief period which Mr. Hering has indicated, so far as we understand his meaning.

The Mercey and Elbe rivers have been described as places where quantities of sewage were being disposed of without injurious consequence,—in fact, without being visible. I would ask you to consider that they are both turbid rivers, particularly the Elbe, and that experiments have been made, and analyses of the Elbe, which show that, although the sewage is discharged only on the outgoing tide, evidences of it are clearly discoverable at the water works of the city considerably above stream.

It is not a question alone of producing wholesale nuisances throughout these harbors that objection is made to increasing the amount of sewage pollution. The question of extensive local nuisances is one of very considerable import.

It has been urged that cost—Mr. Hering said, that cost should not control in this matter—The Metropolitan Sewerage Commission would urge that you give considerable weight to that point.

292 If there is no other reason than cost—if there is any other reason than cost to prevent the purification of the sewage or the handling of it in other ways without discharging it in the raw condition proposed, we believe—we do not appreciate it.

We believe that the disposal of the sewage under water in the manner proposed is in the nature of an experiment, and, although we are not prepared to say to what extent the harbors and channels will be silted, nor to what extent precisely other injuries may come to navigation or to the public health, we believe that safety requires that no question of doubt be allowed to attach to that matter.

I would also ask you to consider that there is a difference between the discharge of the sewage at the Passaic outfall and into rivers, in this respect at least; that, whereas the discharge of sewage into a stream running in one direction, may load that stream with, for the time, we will say, uniformity,—with a current such as flows backward and forward in New York bay, the water would get a double dose of sewage, or, at least, some of it would. The current which flowed up stream towards the end of the tide would return and get a second dose on its way towards the sea.

Mr. Hering, and I think perhaps others, have suggested that experiments be made to give us more light upon this uncertain question of diffusion. We know very little about the phenomena of diffusion,—of sewage in salt water particularly. The Metropolitan

Commission considers that a heavy burden rests upon it for
 293 ascertaining some of those essential phenomena. If it is admitted that we know little now about those matters, we think there is more reason for considering that uncertainties attach to the projects of discharging the sewage in accordance with the proposed plans of the Passaic Valley Sewerage Commission.

Mr. Sandford: Gentlemen: I am not here under pay. I am not here by invitation of the Sewerage Commission. I am not here by invitation of New York City. I have a diversity of interests that are affected in various ways by this question of sewage. In the first place, I am the owner of three different tracts of land on the Passaic River. The sewer, if built, passes through lands owned by me for seven hundred and fifty or eight hundred feet. I am in the contracting business, and have vessels and boats in the Passaic River. I am the president of the New York Lighterage Company of the City of New York; we have vessels here. I also have interests in coast-wise vessels.

Now, it would seem to me—I have heard these discussions from the beginning—it would seem to me that the gentlemen—that a commission of the City of New York and one from New Jersey should get together on this matter and determine what is best at the present time and for the future,—not forever.

We know, about twenty odd years ago,—not over twenty-five years ago, the City of Newark spent a good deal of money building a sewer down into Newark Bay. That don't answer the purposes to-day. Now, they are asking the others to join with them and make a better arrangement. Now, this may be good for ten
 294 or twenty years and after that we may need something else.

Now, I have heard Mr. Eastwood, of Belleville. I own property there myself. He told you about the houses being affected,—the paint on the houses. The gentlemen here the other day told you how the paint was affected on the boats. Now, I don't want to have this matter cured up in the Passaic River, if it is going to come out here and take the paint off of my boats here. Now, that is one of the conditions.

Now, twenty years ago I lived in a residence on the Passaic river at Belleville where we pumped the water out of that river and used it in our homes. Eighteen years ago, about, the gentleman—I am sorry that gentleman from Orange is not here—Orange is a progressive city—they built, eighteen years ago a sewer, and their receiving chamber is in the City of Newark. Under the laws under which that was built—and I know particularly about it because I was a bidder on this work—they were to store this sewage in this receiving chamber and let it out when the tide was ebbing,—but they have gone ahead of that. They have progressed!! They have abandoned the Moon Island plant and have gone over to the "Deer Island" plant: they let that out one day, and then lost the key and have never been able to close the gate since. I left my home (when that sewer was being built, I moved to Newark while it was being built) at Belleville. I live over in Orange to-day. The argument
 295 was: There was very little building below there, and if they let it out on the ebb tide there would be few people affected

thereby. But, they did the other thing. They allowed it to flow at all times of the tide, and, therefore, they are one of the chief polluters of the Passaic River. At Belleville, the very town that they are polluting to-day, I own three houses on the river, where I have tight cess pools and tight water-closets, and it costs me Thirty dollars every little while to have them cleaned out; but this gentleman from Orange, this progressive man,—he puts his filth down there, and it floats by and down the river before those houses.

I don't believe these gentlemen have any objection whatever to those gentlemen of Orange having a filtering plant such as that which he suggested, on the Meadows,—we have one now in Newark, and the people have had them before a jury a number of times because of the way they take care of that. If they want one, let them build a system out of the city of Newark; we will get along without them. But let them put their filtering plant—their filtering basin up in their own territory.

Now, gentlemen, we are all identified in some way or another. I have, among other interests, an interest in the New York Horse Manure Company, that takes the manure off the streets of this city. We own our own floats; we own our own dumps, our own storage land. We take the manure every day from this city and take it out of your jurisdiction and over into New Jersey; we stored it on the Hackensack river up to about one and a half years or two years ago. You had a smelling committee over here in New York which discovered that heap of manure, and one of the arguments they used was that the Pennsylvania had cars stop near that manure heap and that the flies got into those cars and were carried to New York. They didn't think anything about all we carried out on those manure cars. It was the flies that left the manure cars and got into the other cars. Now, what is the consequence? We were driven to the woods! We had to go out on the Rock Hill Branch of the Pennsylvania Railroad and buy a piece of land; here we were using land over there that belonged to the railroad company and didn't pay a cent of rent for it; we have had to put in a great system of tracks for it, and all of that is of vital importance to me because, on account of the great expense this year we have not been able to pay a dividend.

Now, gentlemen, we have all got to help each other a little bit in this matter. As I told you, I don't want this sewage to come down here and in place of taking the paint off of my Belleville houses, to take the paint off of my boats, if possible; but when you go up there and see that little stream of water and see the immense mass of filth that it is expected to carry,—no larger until it goes from Passaic until it gets to Newark, and the water supplies have cut off the entire flow of the river, and all we have to-day to take care of this sewage is simply the water that flows in from Newark Bay. That is all that we have to take care of all that sewage.

There are so many things to be said, gentlemen, but I have just brought this thing to your attention, perhaps in a different way, and it is a matter I know something about. I have lived on that river. I have been around New York for the last

forty or fifty years, and I think I know the situation pretty nearly as good as any one else. I haven't any photographs, nor anything in bottles!!! I am only giving you plain facts.

Mr. Lebkuecher: I understand that Mr. Hering feels that perhaps some of the remarks in regard to disposal have not gone into the records just right, and have perhaps been misrepresented by the opponents, and he would like you to give him an opportunity to make that clear.

Mr. Hering: Mr. Chairman, I understand, from members of the Commission, that some of the opinions I have stated were evidently misunderstood, and I would like very emphatically to have you understand just what I do think in this matter.

I am, without the slightest question, and with no hesitation, in favor of this method of disposing of the sewage of the Passaic Valley which has been recommended by the Commission: as being by far the best solution of this problem.

I have stated that, so far as the expense was concerned, I believe, from present indications, that it would be more expensive to dispose of this sewage in the next-best way,—but it seems to have been misunderstood in this way: that I said the first cost of installation would be less than with this system; but the cost of operation is so large that when you take the entire cost of the problem,—the interest on the investment, the depreciation, and all of the fixed charges, and add to that the very high cost of maintenance and operation, that it would be more expensive, decidedly more expensive than this system here. I do not think that it is cheaper, irrespective of the fact that we have got a good deal to learn yet about the details.

Dr. Soper: Mr. Hering, didn't you say that that question of expense should not be a controlling incident?

Mr. Hering: I did say that.

Dr. Soper: And that you are not considering expense in this matter?

Mr. Hering: I did say that, and I wanted to advert to that now.

Our experience in this matter is confined to Europe and the United States, and this whole question of sewage purification has been one that has changed its aspect every few years; and we have not reached yet a finality.

I do not believe that over the whole situation of Newark you would find an available spot to-day for putting works of this kind; and I do not believe that is a very permanent institution. I am strongly of the belief that the people would object to it and that you could not put up works of the kind there; and I believe that they would have good reason to object, because that whole territory would be depreciated in value. I count that very highly.

Then, another thing, which is still more important in my estimation. When you have a work of sewage purification, it means constant attendance—constant study of how to purify this sewage at this moment in the best way; it means an intelligent management; there would have to be a force,—a large organization to conduct a work of this kind; that brings in a city department,

almost, into existence, or some part of a department, to run this thing.

Now, I have always felt that cities should be recommended that which is most simple—taking that point of view, that is, decidedly, the simplest solution for a large public work; it does not require any large force for attendance, (and you do not know whether they are always going to do everything just as it should be done) whether you are not going to get an odor, which is particularly objectionable, or but something won't go wrong. We find that even in well-regulated large, and, therefore, that has always been a very weighty consideration with me, for if I could dispose of the sewage in a simple way—particularly by dilution—I would always do it even if it was more expensive. If it was more expensive even, I should recommend this system than to have a work of purification, provided it cost no more, than would accrue in this case, and I only see disadvantage. I do not see any advantage in the ultimate result over this, and I see the disadvantages of the large force of operation as well as the disadvantage to the people living around it, even though they live half a mile away from it.

Therefore, I am absolutely of the opinion that this is decidedly the best system for the territory to adopt, and I should not like to be misunderstood in that matter.

The Chairman: Is there anything else?

Mr. Hering: Now, I should just like to reply a moment to Dr. Soper, with reference to those jars of sewage—I refer to the settled sewage where all the suspended matter is deposited first, and that is what Dr. Fowler speaks of; this is not settled sewage; this is raw sewage.

Dr. Soper: I beg your pardon, this is settled sewage.

Mr. Hering: Well, then, you will have to settle that with Dr. Fowler.

Dr. Soper: I know him very well: I should be pleased to.

Mr. Hering: Another point is, I would like to mention, and that is about the flies. It was brought up twice. Now, gentlemen, the first thing I heard of in Europe this Summer, and this was in England, they were claiming how fine they were getting along,—that there was an odor, but faint, "But the flies!!" There has never been such an exhibition of flies in England or anywhere, than since these disposal systems have been introduced. They fill the contact beds; they breed right under the stones. You pick up a stone, perhaps, and under the edge, under a little bit,—all flies. We know that there are flies in connection with these plants; there may be a way of overcoming that feature; it has not been thoroughly demonstrated as yet; there are flies, floods of them in every plant and complained of very generally. Therefore, the fly question could not be used as an argument in favor of this system of sewage purification. I have not the slightest doubt there will be found some means to reduce that evil, so I do not place any weight on it, but it is an actual fact that a splendid breeding place for flies is right under the stone.

Then, too, one thing more: that is what Dr. Soper said about the

tidal stream coming up and getting the sewage and going back and getting a double dose. Now, that is perfectly correct,—but that is provided for in making a very liberal estimate of the dilution, and I would like to say this: that is no worse than storing the sewage,—holding it back until the out-going tide and then letting it go out in the out-going tide, because, then, you get a double mass of sewage on the out-going tide. It has been found better not to store up the sewage. There are exceptions to that case, but it is better to let it be dispersed and go up and down with the water, as found finally in Boston.

Mr. Schondelmeier: My name is Schondelmeier: Physician. I represent the Broadway Buyers trade and the Right Buyers Trade, of Brooklyn.

This matter of sewage has been under consideration for quite a time in these boroughs. It is a subject we all know is growing in interest, and is forced upon us.

I will not take up your time by repeating what has been said yesterday and to-day; that it is objectionable,—that it would
302 be objectionable if this trunk sewer were constructed and the sewage emptied into the Bay. I will just mention a few cases that are proof in evidence in this day that sewage plants can be constructed and operated satisfactorily. I will refer you to the sewage plant of Elmhurst, which is just above the Flushing Bay a short distance; it does its work so perfectly that as the water leaves the plant it is as clear as the water on the table which we use for drink.

We have another illustration in the sewage plant of Saratoga, where, as the water flows out into a small stream of water,—first into a large stream, located below the plant, algae develops there and other plants grow right in the water,—water coming out of the disposal plant after having been filtrated—so that it is possible to purify,—to withdraw all adulterous material from sewage. It is merely a matter of expense and wanting to do it. Saratoga has laid the problem by, as I have been told, by paying about two hundred thousand dollars for the plant, and is now running it constantly at an expense of two thousand dollars a year.

The plant at Elmhurst is minus the flies. I have proven it to my own satisfaction by having investigated it. There are practically no flies there. There is very little odor there. If those things are possible, and right near by, where it would be as reasonable to offer as an excuse that "We have not the land" and "We have not the room to institute the plant"—for they certainly have. The room is there in Jersey, as they intend to carry the sewage over twenty miles above the Bay here, right near our river-front, we
303 are disposing of it in a proper, sanitary, method.

Therefore, we do feel, and in offering this protest we offer it emphatically and earnestly, we do feel that the efforts that are being made by the City of New York and by organizations interested in the disposal of sewage in a proper way,—we do feel that others should encourage us in this work, and not ask us to permit them to do what we are endeavoring to overcome ourselves.

Mr. Lebkuecher: May I ask the gentleman what efforts the City

of Brooklyn, or what efforts the City of New York has made,—what has been done towards a sewage disposal plant in the City of Brooklyn?

Col. Knight: I fear you misunderstood him; he referred to the efforts made at Elmhurst.

Mr. Lebkuecher: I did misunderstand him.

Mr. Child: Mr. Chairman, and Gentlemen: In the few remarks I desire to make, I propose to discuss entirely the questions of obstruction to navigation. I have been living in an atmosphere of sewage for the last seven years, and the mere mention of it gives me qualms of the stomach; and I have no desire to discuss that.

As I understand it, the province of this Board, the peculiar jurisdiction of the Board is to see to it that navigation is not interfered with, either by improper construction or in any other way.

I also understand that in considering the question of the wants of navigation, that this Board will take a broad, comprehensive view,—not confine itself to the limited section in the immediate neighborhood of Robbins Reef Light, but will look over the whole field.

It is known to you, gentlemen, that the Newark Bay is a very considerable body of water. It is known to you that the Passaic river is a navigable river for many miles up from the Bay and that the commerce of the Passaic river is very great. It is also known to you that you have had probably as much trouble in keeping matters in a proper condition in the Newark Bay and in the Passaic river as in any other territory under your jurisdiction.

Now, you cannot but say that this improvement—and we call it an improvement, and advisedly so—that this improvement will be in the interests of navigation so far as the Newark Bay is concerned, and the Passaic River. We will take out and we will keep out of that river the very things which make your task in keeping navigation open throughout that territory so difficult. That is one thing.

Now, in the next place, it is alleged, and that is all, it is alleged that some obstruction to navigation may result at the outfall of this sewage. It has not been shown that, in the Metropolitan District of Boston, any such obstruction has resulted. No complaint has been made by the Harbor Line Board having charge, unless you gentlemen may have, having charge of that territory. No one has shown to you that any result, so far as navigation is concerned, no injuries, have existed in connection with work of this character; so that you have, what? On the one side, a certain, positive benefit to navigation over there in the Passaic Valley and in Newark Bay; certain, sure, unquestionable. On the other side, you have mere speculation of something which may possibly occur. Nothing has occurred in the whole history of trunk sewers,—in England, all over this country: No one has shown that it ever had occurred but it may occur.

Now, gentlemen, right in that connection, criticism has been made because these plans are said to be insufficient in detail with reference to the settling basins, the screens, and the outfall pipes.

Now, is there any uncertainty? That which can be made certain, is certain. It is certain!

This application which is pending before you is almost an exact reproduction of the application presented by the Metropolitan District (of Boston) to the Department for permission to locate each of their sewers.

Mr. Brown, who is in charge of that great Boston work, has been in our employ for years. He has been one of our consulting engineers; and, at my request, Mr. Brown sent us a copy of the last application that was made for a trunk sewer in Boston; it was on the exact lines with this, using the identical language.

Now, what do we do? What do we ask? And, before coming to that—I may be ignorant, and, if I am, I am willing to be instructed,—but I do not understand that, when the Department at Washington, acting on the recommendation of this honorable Board, grants its permission, that its jurisdiction is gone.

306 I do not understand that. It is to be only a permission:

It is not a grant. It is always within the control of the Government.

Now, what are we asking? We are not asking, as has been asked thousands of times, and, I suppose, a great many times, of you, gentlemen, a right to obstruct navigation. We do not propose to take from the navigable waters any space at all. We are not proposing to build out bulkheads, extending the lines of bulkhead and pierheads: But, what are we asking? We are asking the privilege of constructing a sewer, which we represent to you will not result in any obstruction to navigation. If it does obstruct navigation, then we will stand shorn and naked of all rights coming to us by virtue of this consent, because no plea of ignorance of right principles of construction could possibly avail.

That is what I understand to be the true position, and no other position would be safe. I take it that, if the Commission should be given this consent, and we should construct a sewer and it should prove an obstruction to navigation, in the harbor of New York, in these waters, why the power is in the Department to do one of two things: Either to compel us to stop using the sewer, stop creating the obstruction, to change our plans, and to remove the obstruction.

Now, what risk does anybody run? We propose to put Twelve million five hundred thousand dollars into this project as an assurance to you gentlemen, representing the Government,

307 that we are acting in good faith; that we have faith in our representations to you, as made to you, and with the full knowledge that if those representations are false, we take nothing.

Now, what do we do? In this application, we provide here, and in the plans, and in the report which is submitted, which is made by our Commission, we are bound by every representation I have made, as well as every matter which is alleged here in this petition.

Now, what do we say? "All work in or below navigable waters, both permanent and temporary to be subject * * *"—to what?—

"to the approval and supervision of the United States authority having jurisdiction over the said waters."

Now, suppose we should—assume that our representations are false,—assuming we should construct these works without screens, without a settling basin, and that we should discharge our sewage raw, and containing heavy matter, and that it should result in an obstruction to navigation: Why, there is the authority,—we have got to get out!

There are many things of this sort that are of no use, that cannot be determined definitely, until the thing is done. But, when a man comes before you, and who claims to possess the requisite knowledge,—the man upon whom the loss, if any, must fall by reason of his failure, if it proves a failure, and he is willing to put up as an evidence of good faith an investment of over twelve million dollars, to give this Board, or the proper authority a bond which will compel us to remove each and every thing which this

Board will determine to be a nuisance.—How does that
308 become a question of such great moment? The size of the settling basins! The size of the screens!

But, we go farther than that; and we want you, gentlemen, to tell us, after we have constructed the settling basin, after it is all done, and after our money is in it, if it is too small, and, if it is too small, we will make it larger.—and we will keep on increasing the size until you are satisfied.

As compared to a twelve million, two hundred and fifty thousand dollar expenditure, why, that is a bagatelle! It amounts to nothing! A piece of masonry, the size of this room, compared with the expenditure of twelve million, two hundred and fifty thousand dollars! So that that is simple enough.

It is the same thing with the screens. Why, with this bond, and with this conditional assent (because it is nothing else) it is more to our interest, having all this money at stake, to see that proper screening is effected than it can possibly be to any community, let alone any individual. Because, assuming—assuming these gentlemen who are so filled with fear and apprehension, that it may be that their fears may be realized within a reasonable time,—why, how simple it is to remove it!

Now we come, for instance, to distribution,—to the arrangements for distribution at the outfall of the plant. I do not know anything about it (and as I have heard these engineers
309 testifying here I was almost glad I did not know anything about it), I do not know whether one pipe, or five hundred pipes may or will be necessary; but, gentlemen, if five thousand pipes are necessary, we are prepared to put them there.

Now, that is all. Now, what more can we do? We say here now,—I say that all we say here, all I say, this binds us, and, as a member of this Commission I acknowledge the obligation imposed upon me when this application was presented to you gentlemen.

Before the sewage enters the pumping station it passes through a grit chamber to remove all gravel, sand and other heavy matter,

and through a screen chamber, where all floating matter will be removed. Now that is the proposition. Now, if we do not do that, then, when the time comes, you withhold your sanction and we will rest content.

It seems to me that the question is of no possible importance. It cannot be told now, as these engineers say. Well, they know more about it than we do (of course, I ought not to say that, because you gentlemen are skilled and learned in these engineering matters,—but I meant myself), but, whether they do or not, I do not know; but they tell us that they have got to wait in order to determine this. Now we will wait, but we are waiting all the time.—all the time! The grip of this Board,—the grip you gentlemen have on us is not relaxed at any time. Your successors, if there should be such, five years, ten years, from now,—indefinitely, now and then, will have exactly that authority.

310 So that I do think, gentlemen, with all deference to the various discussions that have been made, that these two matters are provided for, and that they are provided for in the best and the safest way.

What greater assurance could the Metropolitan District—and these plans are identical, as I have said—give to your Board than that it should be something which you, gentlemen, selected on account of your peculiar ability, with your knowledge, acquired after years of experience, and with your special education, should say was safe; that it was sufficient? Could any jury be selected to decide a question of this nature, more competent, or better qualified to determine such a matter?

But we will give the bond as an additional assurance; and we know that the Government will not refuse a bond—

The Chairman: Well, we don't know as to that, Commissioner.—probably you do—

Mr. Child: Well, that is my point-of-view, being unfortunately a member of the legal profession,—I have had a great deal to do with the legal matters connected with this case, which I do not propose to discuss at all. There is a tribunal before which it must be discussed before long, and Mr. Dean said that he trusted that you gentlemen would defer your decision of this matter until adjudication had been had by the Supreme Court of the United States on the pending litigation between New York and New Jersey.

The questions involved in the litigation in the United States Supreme Court are entirely foreign to any question pre-
311 sented to you, gentlemen. The question which you are called on to determine, as I understand it, is whether this proposed work will be an obstruction to navigation. Whether it is in the State of New York or in the State of New Jersey is of no possible materiality. If it is an obstruction to navigation, you gentlemen would refuse your consent if the application was made by New York or by New Jersey or if made by both, provided you believed that that would be the result.

That question is not involved in the litigation in the United States Supreme Court at all: That is purely a question of sovereign

right. To withhold this until after that decision would be, I think, a manifest injustice to my Commission. Because, there is a great deal of preliminary work which must be done in any event with reference to the construction of this sewer. Because drawings are to be made, in greater detail, of all things, and contracts prepared, ready to be put out in proper shape, and all matters of that kind, which we assume will take us from eight to ten months, and will involve the expenditure of a large amount of money.

The condition, as you heard it described here, is terrible, and ought to be abated with reasonable celerity. Now, to hold us back until the Supreme Court of the United States, acting with reference to the litigation of other questions, should render their decision would be, gentlemen, I submit to you, gentlemen, tantamount to a denial of justice. If we are entitled to it, then we ought to have

it. If we are not entitled to it, then this Board ought to
312 declare that. And then, of course, some other procedure will have to be resorted to for temporary relief,—or we must bear the ills we are now subject to.

And as in this litigation the animus of the suit between New York and New Jersey being solely with reference to the suppression of this sewer,—if you should (I do not anticipate it, and do not see from my standpoint, how you can do it), but if you, in your wisdom, should determine that we are not entitled to the use of that which we are here asking for, that decision on your part would in no way affect this case,—it could not possibly have any influence upon the pending litigation in the United States Supreme Court,—that is, so far as this Passaic Valley Sewerage Commission is concerned. I presume that, the object having been obtained in another direction, it would lead to an abandonment by the State of New York. So that there is every reason to conceive of why the decision, and a reasonably quick decision, should be reached now.

It may be said now that all matters of etiquette and propriety must be decided by each individual for himself; and, of course, this Board is able to decide any question of that character. Now it may be that at first thought it will appear that it would be discourteous to the United States Supreme Court to anticipate their action. Now, as against that, I have this to say: That we were first in the field. We made our application before the suit was
brought, and, on the other hand, if we had not made our
313 application to your honorable Board, the suit would not have been brought; when we made the application, the suit was brought.

And then, inasmuch as this question is not before the United States Supreme Court, and cannot affect—either directly or indirectly—so far as the legal considerations are concerned—any decision which they may reach, I do not see how it is a violation of any of the rules of strictest courtesy.

Of course, if you consider the character of that tribunal, and of the honorable body of men sitting to-day in the United States Supreme Court, it would be folly for any man to believe that they would be influenced in their determination of a question of right,

by a conclusion reached by another tribunal on another and independent point.

Now, with these remarks, gentlemen, I am through; thanking you for the courtesy of your attention. I trust that this Board will see its way clear to grant to the State of New Jersey,—the important part of the State of New Jersey, the relief so imperatively demanded.

Mr. Lebkuecher: May I be allowed to ask Mr. Riker to make a few remarks?

The Chairman: On this phase of the question?

Mr. Lebkuecher: Yes, sir.

The Chairman: I do not think it necessary, that is, if I understand it to be in duplication or reiteration of what has been said—

Mr. Lebkuecher: Merely for the purpose of strengthening it—

314 The Chairman: I do not think it is necessary. Do you understand that if there is anything further to be brought out, the Board is prepared to continue this session, tomorrow, if necessary.

Mr. Lebkuecher: I think we are about through, Mr. Chairman; we have nothing more to present.

The Chairman: Gentlemen, is there any one here who desires to say anything more on this question? The Board desires to give everybody an opportunity—

Mr. Sandford: One remark I would like to make is that I do not know whether the gentlemen are aware that the United States Government, at the present time, are spending a great deal of money on the Passaic river, to make it navigable for larger vessels—

The Chairman: That is entirely within the knowledge of the Board.

Mr. Sandford: I wanted to say, in connection with that, that unless we can get factories and warehouses and so forth, along that shore, where people can work in, why, the deepening of that river will be lost to the community.

Mr. Lebkuecher: Have you all of the data you require, from our Commission?

The Chairman: Everything that has been handed to the Board—

Mr. Child: I do not know as to whether I was understood this morning, when I handed you the extracts from the United
315 States Coast Survey Reports,—I spent considerable time over the Coast Survey reports, and I think you will find them very interesting. They cover all the principles of New York harbor, as to currents, and so forth. I am not going to refer to all of the different data, but it is a comprehensive index to the Bay.

The Chairman: The Board will be prepared to receive any communications bearing on this subject at any time up to and including Monday—

Col. Knight: Why not make it Monday a week, and give them ample time—

The Chairman: Up to and including Monday, December 21st.

The hearing is adjourned.